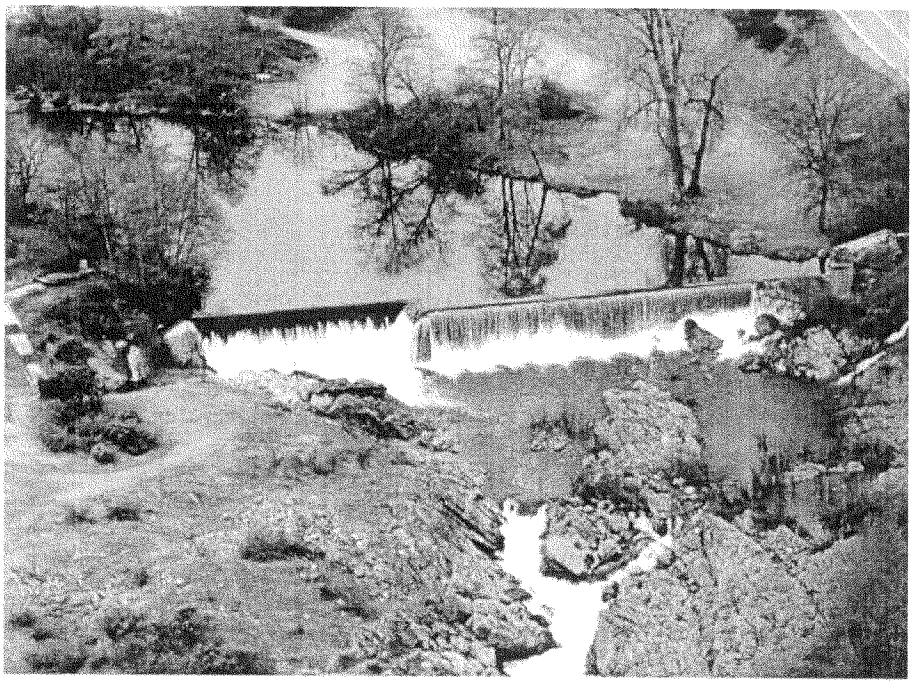
State of California
The Resources Agency
Department of Water Resources
Division of Planning and Local Assistance

SAELTZER DAM FISH PASSAGE PROJECT ON CLEAR CREEK



PRELIMINARY ENGINEERING TECHNICAL REPORT

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Introduction

This report summarizes the findings of the Department of Water Resources preliminary engineering investigation of fish passage solutions at Saeltzer Dam on Clear Creek near Redding, California. Included in the report are preliminary design drawings and cost estimates for project alternatives, discussion of the physical and operational characteristics of the alternatives, and a summary of construction issues and final design criteria. Attached appendices include meeting notes and memorandums, hydrological data used for preliminary designs, an archaeological report, environmental documents, a summary of geologic exploration findings, an initial geologic inspection report, and a biological assessment for the 1993-94 sediment removal project. Appendices to be completed later and bound under separate cover include a geologic feasibility report, draft environmental initial study, and an environmental permit package.

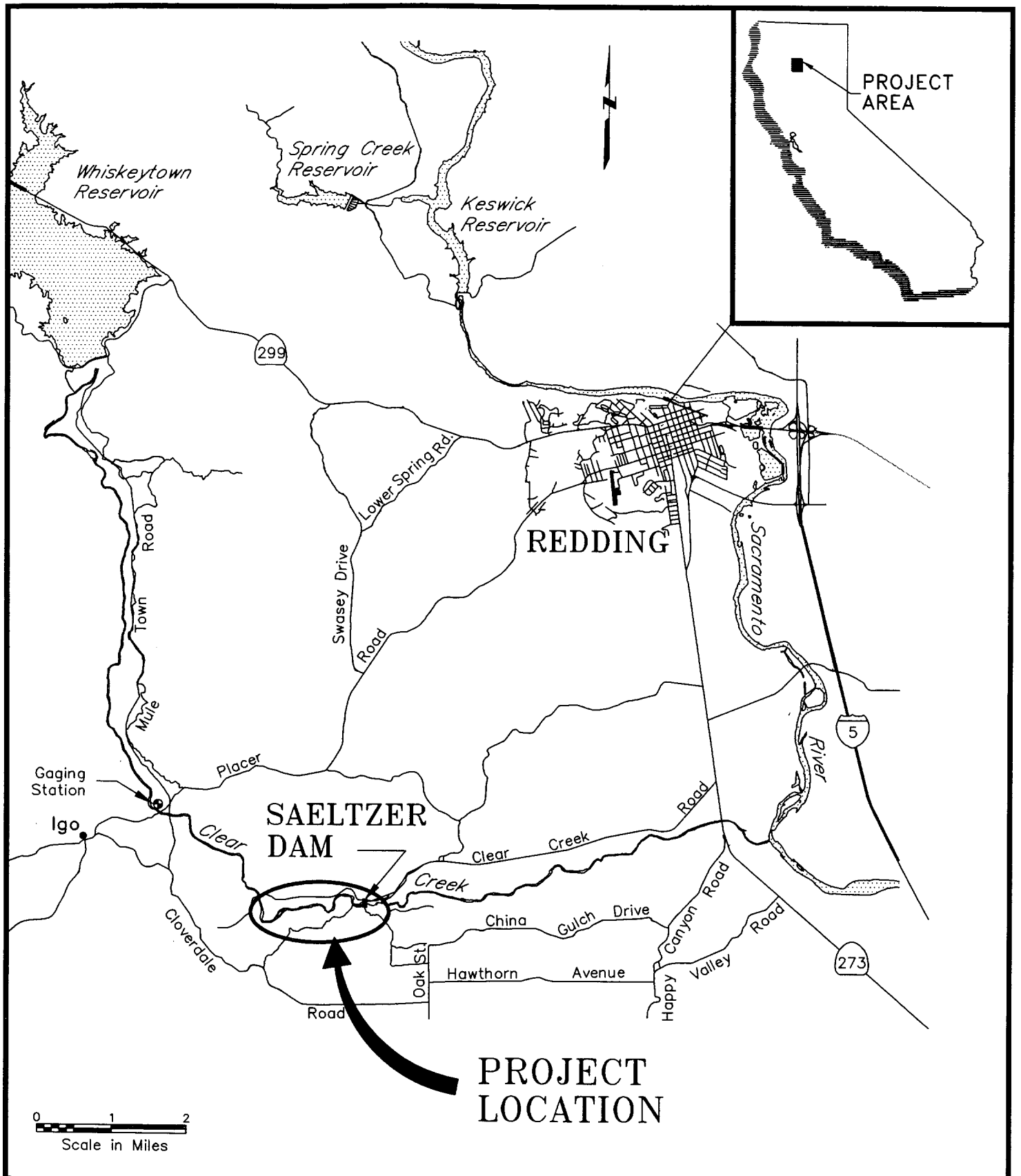
Project Background

Declining salmon and steelhead populations have led to increased efforts to develop restoration activities to preserve and enhance the populations, while respecting the needs of the various stakeholders. The Saeltzer Dam Fish Passage project is part of that effort. The principle objective of the project is to enhance Clear Creek's anadromous fishery by opening up access to about 10 miles of good spring-run chinook salmon and steelhead habitat between Saeltzer and Whiskeytown dams.

Clear Creek is located in Shasta County, California and is the first major tributary to the Sacramento River below Shasta Dam. Clear Creek begins in the mountains east of Trinity Lake and flows approximately 35 miles to its confluence with the Sacramento River, about 5 miles south of Redding (Figure 1). Whiskeytown Dam was constructed about 16.5 miles from the mouth of Clear Creek in 1963 as part of the Trinity River Project of the Bureau of Reclamation.

The privately-owned Saeltzer Dam was constructed in 1903 to divert water through the Townsend Ditch for mining and irrigation purposes. The dam is located approximately 10 miles downstream from Whiskeytown Dam at River Mile 6.2. The water diverters, the Townsend Flat Water Ditch Company, have a year-round, pre-1914 water right of up to 55 cubic feet per second. The McConnell Foundation now owns an 85 percent share of the water right and the Ward Family owns the other 15 percent share.

The 15-foot high by 200-ft. long dam is a barrier to upstream migrating anadromous fish and presents problems for downstream migrants as well (see photos, Appendix G). Compounding the problem is the gorge below the dam. The adult, upstream migrants, traveling up a mildly sloping stream, suddenly encounter a stretch of the creek that rises about 25 ft. in a horizontal reach less than 200 ft. long. The fish that are able to ascend the gorge then encounter the currently impassable dam. The original fish passage structures at the dam were not effective, so in 1958 the California



Location Map

SAELTZER DAM FISH PASSAGE PROJECT

Clear Creek near Redding, California

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
NORTHERN DISTRICT

DRAWING : FIGURE1

Revision Date: December 19, 1997

Department of Fish and Game constructed a 370-ft. long tunnel with a step-pool fish ladder to provide passage from below the steep gorge to the pool above the dam. The tunnel/ladder was not effective either, so it was modified and lighted in 1992 to help attract fish into the tunnel and move them through it. This endeavor was also unsuccessful, so new alternative solutions to fish passage are being explored. In addition to providing passage at the dam, improving fish passage through the steep gorge area just below the dam is an objective of this project.

Project Location and Access

The Saeltzer Dam project area is in Shasta County on Clear Creek, approximately 6.2 miles upstream of its confluence with the Sacramento River (Figure 1). The Saeltzer Dam diversion structure is in Township 31 N, Range 5W, Section 31. The diversion dam, owned by TFWDC, is located on DFG property.

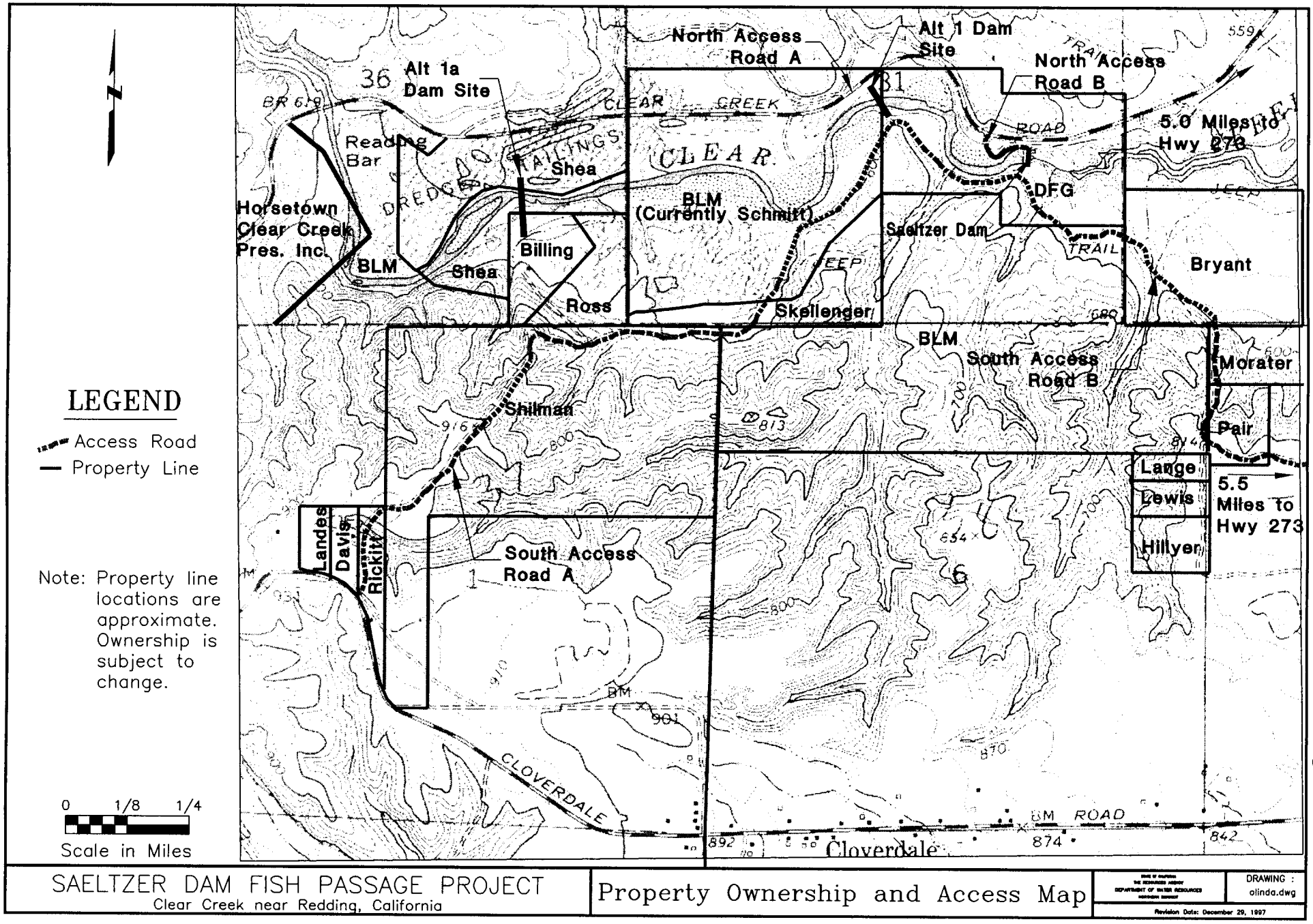
Access for construction will be from county roads and one or more existing dirt roads. Access from the north side of the creek will be from Clear Creek Road, 5.5 miles west of Highway 273, through DFG property near the existing dam site. This access will also include U. S. Bureau of Land Management property near the upstream dam site assuming a land deal currently in escrow with a private landowner named Schmitt goes through. Access from the south side of the creek will be via privately owned dirt roads several miles west of Highway 273, connecting to either Setting Sun Drive, off of China Gulch Drive, or Cloverdale Road (Figure 2).

The dirt access roads will need improvements to provide year-round access to the project. Drainage improvements, road widening and gravel surfacing will be done to provide construction and maintenance access. Easements may need to be purchased by the TFWDC. If access easements from the south side of the dam are not granted, a temporary creek crossing can be constructed, and construction access restricted to BLM and DFG property.

Alternative 2 and 3 project areas are on DFG property. Alternative 1 dam site is on property that is being acquired by BLM. Alternative 1a dam site lies on private property. Acquiring the land or obtaining a construction easement will be necessary if Alternative 1a is pursued. TFWDC has agreed to address all easement issues.

Special Project Notes

The preliminary cost estimates are subject to review by DWR, Division of Engineering staff. The quantities and costs shown in Tables 1, 1a, 2, and 3 are preliminary and are not intended for bidding purposes as final designs may result in changes to any or all quantities and costs. Final designs will be subject to the approval of DFG, BOR, and BLM and will be reviewed by National Marine Fisheries Service and the U.S. Fish and Wildlife Service. Final designs are also subject to California Reclamation Board Standards.



SAELTZER DAM FISH PASSAGE PROJECT
Clear Creek near Redding, California

Property Ownership and Access Map

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Revision Date: December 29, 1997

Figure 2

Project Alternatives

Department of Water Resources Northern District is under contract with DFG and BOR to provide preliminary designs, cost estimates, and environmental documents for fish passage alternatives at Saeltzer Dam. Several scoping group meetings (Appendices B and C) were held with representatives of local, State, and federal agencies exchanging information about the project. The scoping group considered many alternative solutions to fish passage, including those listed below. The alternatives were evaluated based on numerous factors including fish passage, owner liability, operation and maintenance, available water rights, location and condition of existing facilities, stream characteristics, stream hydrology, biological criteria, and availability of funding. Ten alternatives identified in the July 14, 1997 memo (Appendix C) were narrowed down to the three selected alternatives which are underlined below.

Ten Alternatives Identified For Consideration

- Alternative 1: Do nothing
- Alternative 2: Remove dam and buy Townsend Flat Water Ditch Company's Clear Creek surface water right (Could be bought by DFG, CVP, SWP or others)
- Alternative 3: Remove dam and provide TFWDC with an alternate water supply in exchange for their Clear Creek surface water right (Alternate supplies could be local groundwater and/or surface water purchased from other water districts)
- Alternative 4: Remove dam and construct a low head (about 4 ft. versus the existing 15 ft.) diversion dam upstream of the existing dam. Also construct a canal and/or pipeline to the existing headworks structure. A new fishway and fish screen would also be built at the new diversion dam site
- Alternative 5: Remove all or part of the dam and install a bladder dam for use when diverting water
- Alternative 6: Remove all or part of the dam, construct a flashboard stanchion system, and install flashboards when diverting water
- Alternative 7: Remove dam and reconstruct a new dam at the same location with a fishway through the new dam
- Alternative 8: Improve the existing fish ladder and tunnel
- Alternative 9: Construct a new fishway through the existing dam
- Alternative 10: Construct a new fishway around the south side of the existing dam

Note: All of the alternatives listed above, except Alternative 1, include potentially modifying the gorge below the dam to improve fish passage.

Some of the alternatives have common underlying factors that make them less desirable than the other options. The alternatives calling for TFWDC to sell or exchange their water rights have been considered potential long-term solutions, but those options are solely the decision of TFWDC. Alternatives involving partial removal of the dam are not very practical because TFWDC has the right to divert water all year. The operation and maintenance requirements for raising and lowering part of the dam will probably not be accepted by TFWDC. The questionable structural integrity of the dam means modifications that involve the existing dam would likely result in the need to rebuild the entire structure. More specific reasons for elimination of alternatives are described in the July 14, 1997 memo contained in Appendix C.

The scoping group decided to investigate the remaining feasible options, narrowing the ten alternatives down to three. It was agreed that DWR would investigate Alternatives 4, 7, and 10 above, which are now referred to as Alternatives 1, 2, and 3, respectively. See Figure 3, which is a project site map showing major features of the preferred alternatives.

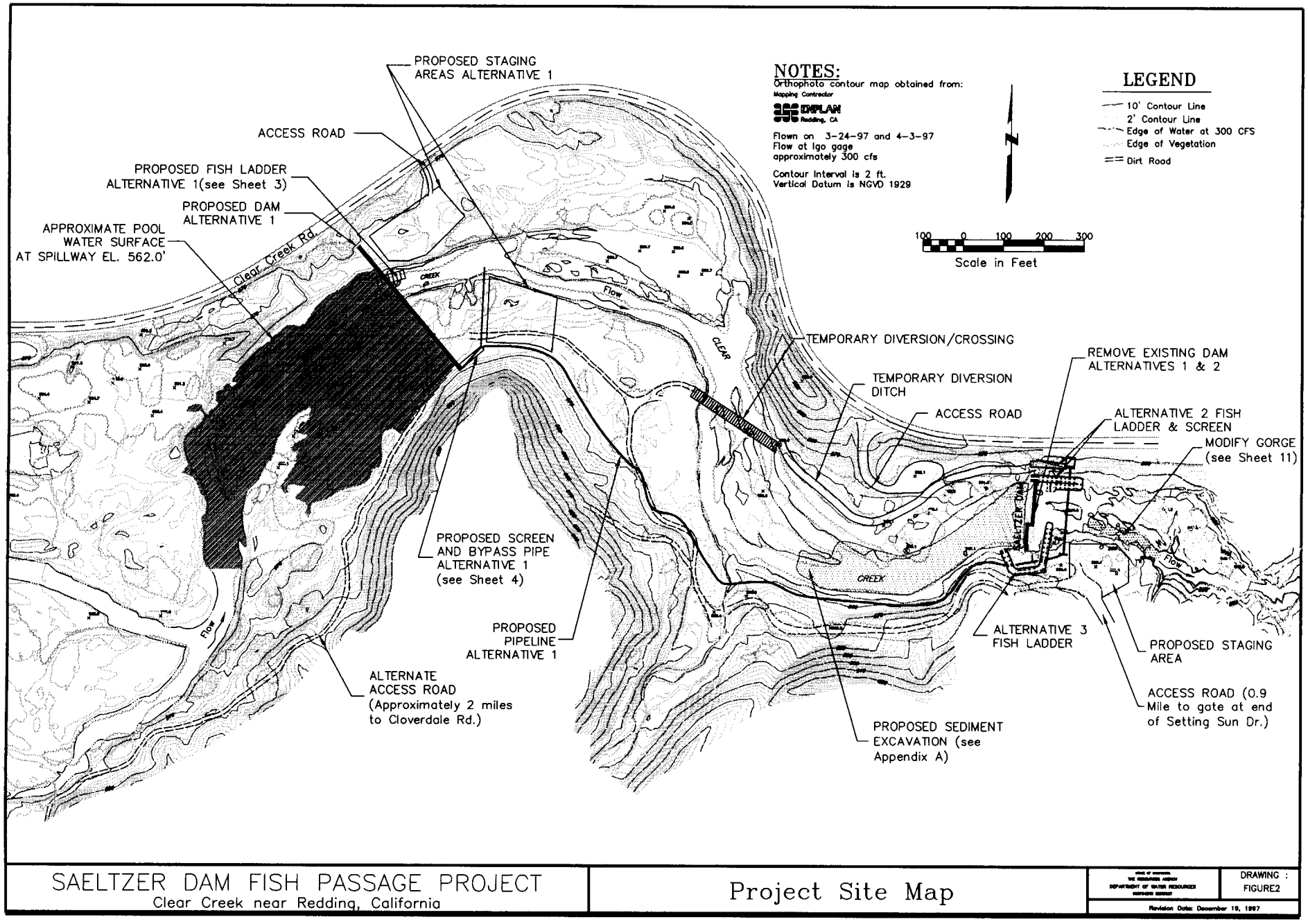
Alternative 1 (formerly 4) was chosen for investigation because of the superior fish passage advantages of a 4-ft. high dam compared to a 15-ft. high dam. Alternative 3 (formerly 10) was selected because it was viewed as the most straight-forward solution to passage at the dam and probably the cheapest of the potentially feasible solutions. Alternative 2 (formerly 7) was selected because of the concerns about the stability of the dam and the possibility of future failure that would effectively render Alternative 3 (the south bank ladder) useless.

After geologic exploration determined that depths to bedrock at the Alternative 1 dam site were greater than initially believed, DWR agreed to take a cursory look at the Alternative 1a dam site, further upstream. Refer to Summary of Findings, p. 11.

Pumping Alternative

Another alternative that DWR briefly researched was removing the dam and pumping the water from the creek into the TFWDC ditch. A 55 cfs pumping plant would cost roughly $2,000,000 to construct. The potential for TFWDC demanding a dual pump setup to prevent interruption of water deliveries during breakdowns could add to the initial cost. Although TFWDC does not divert their full water right all year, the power costs of pumping 55 cfs year-round was used for project comparison. Daily pumping costs of about $700 would total about $250,000 per year. Additional operation and maintenance costs could push the total annual operating costs to about $300,000.

If the TFWDC were to accept a pumping project, an annuity account would probably need to be set up to generate the annual capital needed to operate. For this



SAELTZER DAM FISH PASSAGE PROJECT
Clear Creek near Redding, California

Project Site Map

DEPARTMENT OF WATER RESOURCES

DRAWING : FIGURE2

Revision Date: December 19, 1997

Figure 3

reason, potential legal complications, and because TFWDC indicated to DFG that it was not willing to trade gravity flow surface water for a pumping plant, the group decided to not pursue this alternative any further at this time.

Description of Investigation

DWR, Northern District engineers met with the scoping group and discussed project objectives and alternatives (see meeting notes, Appendix C). DWR began the preliminary engineering process with site surveys and analysis of hydrologic and biological data. DFG and NMFS screen and ladder design criteria were referenced in determining design requirements for the fish ladders and screens. The Bell Fisheries Handbook, "Fishway Design Data", the Ken Bates report, "Pool-and-Chute Fishways", and articles contained in the USFWS "Fish Passageways and Diversion Structures" binder were referenced while determining ladder configurations, pool sizes and entrance and exit criteria. DFG biologists and a DFG hydraulic engineer were consulted during the design phase. Also, assistance with cost estimates was obtained from DOE. DWR geologists were consulted and ND environmental specialists began the environmental site evaluation and permitting process.

Dam Inspection

DWR investigation of alternative passage solutions began in early June, 1997 when ND staff met with Mr. Frank Glick, Supervising Engineering Geologist, DWR, DOE, to examine the dam site and estimate the cost of performing an integrity study and obtaining core samples from the dam. The focus of the visit was at the existing dam site because it was stated at the May 7, 1997 meeting that alternatives involving removing the dam were the least feasible being considered. Thus, the major concerns at that time were determining the ability of the dam to withstand the effects of nearby blasting and/or partial removal for construction of a fish ladder through the dam.

Inspection of the dam confirmed previous observations by some of the coordination group and engineers from BOR and CH2M Hill, a private consulting firm, that the structural integrity of the dam is questionable. Construction activities involving cutting through the dam could increase leakage through the dam and possibly cause dam failure because of the poor physical condition of the dam. However, construction activities close to the dam, including controlled blasting, could be performed without damaging the dam. Refer to the Initial Geologic Inspection memo (Appendix G) for more details.

The findings of the geologic/engineering inspection were discussed with scoping team members and everyone agreed that cutting into the existing dam would not be wise. It was decided that DWR's focus should be on three alternative projects: 1) a new low head dam upstream with screen and ladder and conveyance system to carry water to the existing ditch, 2) a new dam at the same location with a left bank fish ladder and screen, and 3) a right bank fish ladder.

Alternative 1 would demand the most analysis because locating the best dam site, designing the conveyance system and determining the alignment would involve a somewhat more elaborate investigation than for Alternatives 2 or 3. Initial thoughts were that designing an open ditch and/or pipeline along the north bank of the creek

would be the most practical solution since the existing ditch was on the north bank. The challenge ahead was where to locate the low head dam to attain enough elevation to provide the necessary conveyance slope and also be economically feasible.

Townsend Flat Water Ditch Company Proposal

In June, 1997, TFWDC asked Mr. Norman Braithwaite, a private engineer, to conceptionally design a project similar to Alternative 1, provide a project cost estimate, and apply for CalFed Category III funding by July 28,1997. TFWDC decided to apply for funds in the July 28 round of Category III funding to pay for final designs and construction and preparation of an RFP seeking firm bids for construction of the project.

Dam site locations were investigated by Mr. Braithwaite in coordination with DFG. A pinch point in the creek about 2,000 ft. upstream of the existing dam was selected because of the relatively narrow bank to bank width of 400 ft. and the fact that bedrock is exposed in the creek. The physical conditions of the site indicated that the location might be the most economically feasible site for an upstream dam.

In early July, DFG met with DWR at the site to point out where the upstream dam site would be if TFWDC got CalFed funding for their preferred project. DWR agreed that the site had potential and agreed to focus on that location for comparing the feasibility of Alternative 1 to the other alternatives.

Surveying

ND began site surveying in early July and compared elevations with the orthophotographic contour maps produced by Enplan Mapping Contractor of Redding. The correlation between the two sets of data was fairly good, but not consistent enough for structural design purposes involving construction at the dam. However, the flown contour mapping, with 2 ft. contour intervals, was sufficient to perform preliminary designs of Alternative 1 project features. The DWR site survey focused on the terrain in the immediate vicinity of the dam, the gorge area, and the ground below the water surface, which Enplan's orthophoto map did not include. The DWR contour maps, with 1 ft. contour intervals, were produced using AutoCIVIL software run within AutoCAD. Additional detailed surveying may be needed for final design purposes.

A meeting was held on July 18, 1997 with DWR, DFG, and Mr. Braithwaite to discuss issues and concerns about the project and determine how DWR and Mr. Braithwaite could best work together in completing designs and pursuing funding.

Mr. Braithwaite's vision of the project, as described in Alternative 1, page 15, was discussed. It was decided that DWR would continue with the Preliminary Engineering Report and Environmental Initial Study with emphasis on Alternative 1 (assuming the restoration group would agree to support this alternative) and address the two other alternatives which could be implemented if a roadblock was encountered during the Alternative 1 design phase. Also, a Geologic Feasibility Report would be

prepared after completing geologic exploration at the upstream dam site. DWR would continue with the survey of the gorge area and may survey the upstream dam site prior to the final design phase. The orthophoto contours produced by Enplan were deemed sufficient for the preliminary design and cost estimate for Alternative 1. Although DWR had intended to investigate a north bank conveyance system, it agreed to investigate the south bank pipeline and creek crossing proposed by TFWDC for feasibility comparison. Also, the geologic exploration outside the immediate area of the dam site would be focused where the data could be used for final designs and to help predict what might happen to the stream geomorphology when the gradient is changed by removing the existing dam.

Excavation of Test Pits

On August 6, 1997, three exploratory test pits were excavated at the approximate location of the proposed low head dam about 2,000 ft. upstream of Saeltzer Dam (Memo - August 8, 1997). The three pits were dug along the proposed alignment by BLM and logged by the DWR, DOE Supervising Engineering Geologist (Appendix H). The test pits were excavated to 8 to 12 ft. below existing ground surface in alluvium on the south side of the creek (see Appendices F and H). No bedrock was encountered in any of the pits, so potential issues were raised about Alternative 1 and the possibility of channel degradation below the proposed dam if the existing dam were removed. Since the exposed bedrock in the channel appeared to be an anomaly, assumptions based on an expected shallow bedrock layer were changed. Refer to Summary of Findings, p. 11, for further discussion.

Seismic Lines, Exploration Drilling, and Additional Test Pits

Due to the potential issues involving the depth to bedrock upstream of Saeltzer Dam, it was decided in an August 11, 1997 meeting to expand geologic exploration at the proposed site and to include another possible dam site about 600 ft. upstream of the proposed site with hopes of finding shallower bedrock for a dam foundation. Exploration would also be conducted along the proposed pipeline alignment and in the areas where potential channel degradation might occur.

Collection of seismic refraction line data to determine depths to bedrock began on September 2, 1997. ND staff assisted DOE Project Geology staff in collecting data along 13 lines for a total of 2,108 ft. in the proposed dam area and in the vicinity of the proposed pipe alignment. Apparent depths to bedrock varied from about 7 to 19 ft. below the ground surface. Refer to the map and data summary sheets in Appendix F and also Appendix H for details.

Exploration drilling began on October 28, 1997 and included augering to refusal (usually top of bedrock) as well as core drilling to correlate the seismic line bedrock depth information and to determine the engineering characteristics of the bedrock. Drill logs were prepared by DOE Project Geology staff for the 12 bore holes drilled by P.C. Exploration, Inc. During the same time period, two additional test pits were excavated by a BLM backhoe operator. Samples from the test pits are retained at the ND office

for review or testing by interested parties. Logs of these test pits were also prepared. Depths to bedrock in the bore holes varied from about 11 to 20 ft. below the ground surface. The depths to bedrock encountered heightened earlier concerns about the Alternative 1 dam site, including increased dam height, resulting in increased costs, and the potential for headcutting. The findings led to the investigation of another dam site, Alternative 1a.

Environmental Documentation and Permits

ND Environmental Specialists and a DWR archaeologist performed environmental site surveys of the project area to document potential environmental and cultural issues. A cultural resources survey was performed, including an archaeological and historical records search by Chico State University, Department of Anthropology, Northeast Information Center staff (Appendix E). The cultural resources site survey revealed no significant archaeological or historical resources at the site, partially because heavy gold mining had disturbed most of the project area. Construction of the existing dam, ditch, and roads had disturbed the rest of the area. No significant environmental issues have been identified to date. Additional site surveys will be conducted when a project alternative is selected for final design and construction.

A draft Environmental Initial Study, which could be the basis for a Negative Declaration, is being prepared for California Environmental Quality Act and National Environmental Policy Act compliance (Appendix I). DWR staff coordinated with DFG, U. S. Army Corps of Engineers, USFWS, and Central Valley Regional Water Quality Control Board concerning project permitting. An information package is being created that will accompany all permits (Appendix J). The package is retained at ND. Finally, three tables were created that list the environmental permits potentially required for the project, state and federally "listed" species that may occur in the area, and potential environmental issues related to aspects of the three alternative projects (Appendix A).

Permits required for this project will be similar to the permits acquired for the 1993-1994 Clear Creek Fishery Habitat Restoration Projects. See Appendix A, "Status of 1993-1994 Clear Creek Fishery Habitat Restoration Project Permits", dated December 5, 1997, for a description of those permits and status. Permit applications will be submitted by an agent of TFWDC.

Summary of Findings

Comparison of Alternatives

Alternative 1	Cost
• Remove sediment above existing dam	$5.5M
• Remove existing dam	
• Construct a 3300 cy concrete low head gravity dam about 2,000 ft. upstream of existing dam	
• Construct a 64-ft. long, 20-ft. wide pool & chute ladder within the dam	
• Construct a 65-ft. long fish screen on the south bank	
• Construct a concrete diversion structure with headworks	
• Construct a 42-in. dia., 1825-ft. long diversion pipeline	
• Construct a 215-ft. long, 48-in. dia. steel pipe, elevated creek crossing	
• Modify downstream gorge	

Alternative 1a	Cost
• Same as Alternative 1 except:	$5.1M to $5.5M
• Construct a concrete gravity dam (approximately 400 cy to 900 cy), about 6,600 ft. upstream of the existing dam.	
• Construct a 6,600 ft. pipeline.	

Optional 1a

- Construct a 6,600 ft. concrete lined ditch instead of pipeline ($4.1M to $4.5M)

Alternative 2	Cost
• Remove sediment above existing dam	$3.8M
• Remove existing dam	
• Construct a 1350 cy concrete gravity dam at same site	
• Construct a 210-ft. long, 15-ft. wide step pool ladder at the north bank	
• Construct a 65-ft. long fish screen on the north bank	
• Modify/Construct concrete/headworks portion of diversion channel	
• Excavate bedrock channel to gorge	
• Modify downstream gorge	

Alternative 3	Cost
• Remove existing ladder • Construct a 245-ft. long, 15-ft. wide step pool ladder on the south bank • Modify downstream gorge	$1.5M

Advantages and Disadvantages

The main advantages of Alternative 1 are that it provides superior upstream and downstream fish passage because of the lower head dam. Also, moving the dam upstream allows fish a chance to recover from ascending the gorge before entering the fish ladder. The potential liability associated with the existing dam would be eliminated, but could be similar at the new dam site if potential headcutting to the base of the dam were to occur. Also, the bedload and fish spawning gravel transported past the dam could improve compared to Alternative 2.

The chief disadvantages of Alternative 1 are that it is the most expensive alternative, the new pipeline would increase long-term maintenance requirements, and the elevated pipe crossing could introduce liability issues. If the potential headcutting were to occur, a dam with similar height and liability problems as the existing dam would be created, and the proposed fish ladder could be dewatered, causing a barrier that would require construction of a ladder extension. If the channel degrades and re-routes away from the proposed fish ladder, re-channeling of the creek and/or extension of the fish ladder would be required to maintain fish passage. Also, O & M requirements and costs could be increased due to scouring at the downstream toe of the new dam.

The primary advantage of Alternative 1a over Alternative 1 is that the potential headcutting up to the base of the dam, and related passage and liability issues, may not exist at this site because of the shallow bedrock across the channel at the Alternative 1a site. Also, the total cost of Alternative 1a could be less expensive than that of Alternative 1 because the decrease in cost for a lower dam could more than offset the added expense of the extended pipeline. With the possibility of an open ditch being constructed instead of the pipeline, the cost savings over Alternative 1 could be substantial.

The main disadvantages of Alternative 1a are that the new pipeline or ditch would increase maintenance requirements, and if the channel re-routes away from the proposed dam, re-channeling of the creek would be required to maintain the diversion of water. Also, this alternative could be as expensive as Alternative 1, depending on results of further investigation.

The primary advantages of Alternative 2 are that this alternative provides good fish passage as the fishway can be tailored to fit the site, O & M of a ladder screen on

the same side of the stream would be more convenient, and the liability associated with potential dam failure would be decreased with the construction of a new dam. Also, TFWDC would get a new dam without having to move the point of diversion upstream, which could increase O & M requirements and costs.

The chief disadvantages of Alternative 2 are that the potential liability associated with a 15 ft. high dam would remain with both DFG and TFWDC, it is relatively expensive, and passage characteristics of the high head ladder could be inferior to the potential low head dam and fish ladder at the upstream site. Another drawback to Alternative 2 is that DFG owns the land on which the existing dam lies and wants to sell or trade the land to BLM, but BLM acceptance is contingent on removal of the existing dam. However, this matter may not be an issue if a new dam is constructed.

The main advantages of Alternative 3 are that it is the least expensive alternative, it would provide good fish passage, and construction could be accomplished relatively easily.

The primary disadvantages of Alternative 3 are that passage characteristics of the high head ladder could be inferior to the potential low head dam and fish ladder at the upstream site and the potential liability associated with the existing dam would remain with both DFG and TFWDC.

Conclusions and Recommendations

The most biologically desirable alternative is Alternative 1 or 1a. Significant concern over potential headcutting and channel degradation make Alternative 1 questionable. If the affected parties and funding sources decide that the benefits of an upstream low head dam are superior, then Alternative 1 or 1a could proceed with further investigation. The recommended course of action is to identify an upstream site for a low head dam project similar to Alternative 1.

The main concern about Alternative 1 is that after the existing dam is removed and the sediment is dredged from the reservoir, the new channel invert at the existing dam site will be about 20 ft. below the top of the dam (see Sheet 14). The excavation would cause a significant change in stream gradient between the existing dam location and the upstream end of the sediment dredging. This could lead to upstream headcutting which could potentially reach the base of the proposed Alternative 1 dam. If the channel downcuts to a water surface elevation potentially 10 to 15 ft. below the present water surface elevation at the Alternative 1 dam site, the proposed fish ladder could be dewatered, causing a barrier that would require construction of a ladder extension. If the channel degrades and re-routes away from the proposed fish ladder, re-channeling of the creek and/or extension of the fish ladder would be required to maintain fish passage. If the potential channel degradation were to occur, a dam with similar height and liability problems as the existing dam would be created. Also, maintenance requirements caused by prolonged scouring at the downstream toe of the new dam could introduce an added O & M cost.

The above concerns led to the exploration of a potential dam site about 600 ft. upstream of the Alternative 1 dam site. A seismic refraction line was run, and a bore hole was augered and cored near the possible dam alignment. The 20 ft. depth to bedrock at the site, coupled with the fact that the dam would be more than 200 ft. longer at that site, effectively removed that site from consideration.

Although DWR Engineering Geologists feel that downcutting is likely, a sediment transport model could be run to determine the potential extent of downcutting and headward erosion that might be expected if Alternative 1 is implemented. A thorough evaluation of the potential erosion of the alluvium should be one of the first tasks of the final design process if Alternative 1 is selected.

Another issue to be considered is the possibility of vertical rock barriers, or sharp drops in bedrock existing between the existing dam and the proposed upstream dams. There is no record of the stream channel profile prior to construction of the dam 94 years ago. It is possible that when the sediment is dredged from above Saeltzer Dam, currently buried barriers could be exposed. However, documentation of anadromous fish in the reach above Saeltzer Dam (prior to construction of the dam) indicates that there might not be any buried barriers.

The Alternative 1a dam site location should be investigated further, including surveys and geologic exploration, as that site appears to be at least as economically feasible as the Alternative 1 site. Also, the relative total risk factor is probably lower at the Alternative 1a site compared to the Alternative 1 site. It appears that no channel degradation would occur at the Alternative 1a dam site, although the potential for degradation downstream and the possible exposure of other barriers would still exist.

Alternative 1 - New Upstream Dam, Fish Ladder, Screen and Pipeline

The major components of Alternative 1 are improving the existing access roads, dewatering the work site, dredging the sediment from above Saeltzer Dam, removing the existing dam, constructing a low head concrete gravity dam about 2,000 ft. upstream of the existing dam, a pool and chute ladder within the dam, a concrete diversion structure with headworks and a fish screen on the south bank, a pipeline with elevated creek crossing, and modifying the gorge below the present dam.

The new dam would be constructed because of the superior fish passage advantages of a 4-ft. high dam compared to a 15-ft. high dam. The lower dam would result in less energy being expended by upstream migrating fish negotiating the fish ladder. The reduced stress on the fish could increase survival rates. The lower height and improved shape of the dam could also decrease injuries to juvenile fish that spill over the dam.

The dam would be built with a 50-ft. wide notched section next to the fish ladder to concentrate flows near the ladder, thus attracting fish to the ladder entrance, and help keep the existing low flow channel in its current location.

Also refer to the "Design and Construction Summary", p. 33, for more discussion.

Screen Sizing and Configuration

Although there are many new and innovative fish screen types in use throughout the United States, the continually cleaning screen with horizontal slotted openings is considered by DFG to be the most effective for juvenile spring-run chinook salmon.

The fish screen design alternatives considered were:

1. On-stream screen
2. Off-stream screen

An off-stream screen design was chosen for this site for several reasons. First, an on-stream fish screen could have very high operation and maintenance requirements and costs because of susceptibility to high flow damage. Second, building a protective structure and increasing the screen frame structural strength would add to the initial cost. Third, TFWDC has the right to divert water year-round. Therefore, the great fluctuations in the creek flows and stage would mean the screen would have to be much larger if it were on-stream than if it were built behind the headworks where the water level would be regulated. Finally, there are adequate flows to provide water for the bypass pipe.

The proposed preliminary fish screen design would pass the required 55 cfs design flow while meeting the California DFG Statewide Fish Screening Policy design requirements for salmon and NMFS slot width criteria for steelhead. Although in-ditch

fish screen design requirements allow for a maximum approach velocity of 0.40 ft./sec. for continually cleaned screens, the more conservative criteria of 0.33 ft./sec. for on-stream screens was used because of the added benefits and small extra cost. The calculated sweeping velocity of 2.2 ft./sec. exceeds the criteria of "two times approach velocity". The continually cleaning screen could be constructed in the ditch as shown on Sheets 2 and 4.

With a maximum allowable approach velocity of 0.33 ft./sec. for continually cleaned screens and a maximum design flow through the screen of 55 cfs, the required wetted screen area is 165 sq. ft. (55 cfs/0.33 ft./sec). Adding 40 sq. ft. to the required area to compensate for reduction of screen area due to structural members, the required screen area is thus 205 sq. ft. The screen length was determined based on a water depth of 2.75 ft. in the ditch or pipeline headworks when diverting the maximum water right of 55 cfs plus the 10 cfs return flow. The screen would have a vertical wetted depth of 2.75 ft. With the screens tilted at 30 degrees from vertical, the wetted screen depth is 3.18 ft. Dividing the required screen area by the wetted depth (205 sq.ft./3.18 ft.) yields a required screen length of 64.5 ft. Therefore, a 65-ft. long screen would be constructed.

The proposed screen would have a reinforced concrete foundation and be protected by the headworks structure and retaining walls or flood walls. Frame supports would be spaced at 5-ft. intervals and attached to the foundation. The frame system would support removable Johnson wedge wire or equivalent screen panels meeting DFG's fish screen criteria. The screen height is designed to allow 0.5 ft. of freeboard, which would be adequate except in extreme flood events in which the headworks structure may be overtopped. All fish screen panels would be attached to the structural members such that they could be removed for maintenance purposes.

The screen would be cleaned by a continuously sweeping brush, powered by an electric motor, or an acceptable alternative cleaning system. A concrete access ramp may need to be constructed from the county road to the screen area to allow access for maintenance activities.

Screen Operation and Maintenance

Operation and maintenance would be performed by TFWDC personnel and checked occasionally by DFG. Operational requirements would include assurance that the screen cleaning equipment is functioning properly. Maintenance responsibilities include the replacement of the brushes and other parts when they wear out. Occasional cleaning of sediment from the screen bay might be necessary.

Ladder Sizing and Configuration

DWR began the fish ladder design process by performing a hydrologic analysis of flow records from the Igo gage located about four miles upstream of Saeltzer Dam. The analysis included calculation of monthly exceedances, a three-day delay flow

frequency analysis, and a relative frequency analysis (Appendix D). The 23-year pre-Whiskeytown Dam period and the 33-year post-Whiskeytown Dam period were analyzed.

It was determined that with an 80 cfs fish ladder, fish would be delayed for more than three days only about once every 3-1/2 years, on average. The 80 cfs is based on an 800 cfs three-day delay flow and the desire to have a minimum of 10 percent of the total creek flow going through the ladder during flows less than the delay flow.

Several fish ladder designs were considered for improving passage for target species spring-run chinook salmon and steelhead while considering other species as well. During the design process, scoping team members discussed and analyzed the step pool, vertical slot, denil, and pool and chute type ladders while considering numerous factors including fish passage, owner liability, operation and maintenance, available water rights, location and condition of existing facilities, stream characteristics, stream hydrology, biological criteria, and availability of funding. The denil was ruled out because of its flow capacity limitation. The vertical slot was also ruled out because of limited flow capacity and general observations of increased susceptibility to plugging with debris than other types due to relatively narrow slot openings. Although it was determined that an 80 cfs step pool ladder, like the Alternative 2 ladder, would provide adequate fish passage, the higher flow capacity pool and chute type ladder was chosen because of its capability to accommodate a much wider range of flows, its low-maintenance characteristics, and its proven ability to attract and pass fish.

ND engineers performed a hydraulic analysis to determine the fish ladder dimensions, baffle size and configuration, orifice dimensions, and critical upstream and downstream ladder invert elevations. The ladder would have an operating range of between 5 and 270 cfs. The pool and chute baffles would be 7-ft. high at the 4-ft. wide center notch and slope up to 9 ft.-8 in. high at the sidewalls of the ladder. The ladder would have eight baffles, each 20 ft. wide, which would pass a maximum flow of about 240 cfs while a portion of the flow over the baffles remains in a plunging regime. With the addition of 20-in. x 20-in. orifices, each with a capacity of 15 cfs at 1 ft. of head, the total flow in the ladder would be about 270 cfs.

Studies have shown that some fish prefer orifices to baffles. The orifices would allow the fish to ascend or descend the ladder without jumping over the baffles. Also, the orifices would help pass sediment through the ladder, decreasing maintenance requirements.

Ladder Operation and Maintenance

Operation and maintenance requirements would include cleaning debris from the ladder, including orifices, weirs and the trash rack. The flashboards in the notches may need to be adjusted to maintain 1 ft. of drop between pools. The baffle orifices may need to be closed during extremely low flow conditions.

Construction Summary

The Alternative 1 construction project would include:

- obtaining access easements
- improving the existing access roads
- clearing and grubbing the site
- dewatering the work site
- removing sediment above the existing dam
- removing the existing dam
- excavating for the new dam and ladder construction
- constructing a 3,300 cy concrete low head gravity dam about 2,000 ft. upstream of the existing dam
- constructing a 64-ft. long, 20-ft. wide pool & chute ladder within the dam
- constructing a 65-ft. long fish screen on the south bank
- constructing a concrete diversion structure with headworks
- constructing a 1825-ft. long, 42-in. dia. concrete diversion pipeline
- constructing a 215-ft. long, 48-in. dia. steel pipe, elevated creek crossing
- modifying the downstream gorge (see gorge modification section, p. 34)
- backfilling and completing site finish work and erosion control
- other miscellaneous work required to complete the project

Advantages and Disadvantages

Advantages:

- This alternative provides superior upstream fish passage
- Moving the dam upstream allows fish to recover from ascending the gorge before entering the fish ladder
- This alternative provides good downstream fish passage
- The potential liability associated with the existing dam would be eliminated, but could be similar at this site if headcutting were to occur
- Could improve bedload and fish spawning gravel transport

Disadvantages:

- This is the most expensive alternative (Table 1)
- The new pipeline would increase long term maintenance requirements
- The elevated pipe crossing could introduce liability
- If the potential headcutting were to occur, a dam with height and liability problems similar to the existing dam would be created, and the proposed fish ladder could be dewatered, requiring construction of a ladder extension

- If the channel degrades and re-routes away from the proposed fish ladder, re-channeling of the creek and/or extension of the fish ladder would be required to maintain fish passage

- If the channel degrades and re-routes away from the proposed fish ladder, re-channeling of the creek and/or extension of the fish ladder would be required to maintain fish passage
- Maintenance requirements caused by prolonged scouring at the downstream toe of the new dam could present an added O & M cost
- Construction of this alternative would be more complex than Alternatives 2 or 3 and may require two seasons for completion

Table 1

PRELIMINARY COST ESTIMATE - ALTERNATIVE 1

ITEM #	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST ($)	TOTAL COST ($)
	MISCELLANEOUS				
1	Mobilization/Demobilization	1	LS	$ 60,000.00	$ 60,000.00
2	Site Work, Access & Mitigation	1	LS	$ 100,000.00	$ 100,000.00
3	Dewatering	1	LS	$ 150,000.00	$ 150,000.00
4	Remove Existing Ladder	100	CY	$ 250.00	$ 25,000.00
5	Remove Existing Dam	1500	CY	$ 150.00	$ 225,000.00
6	Excavation-Pool Sediment	20000	CY	$ 10.00	$ 200,000.00
					$ 760,000.00
	DAM				
7	Excavation- Sand, Silt, Alluvium (Dam)	10000	CY	$ 10.00	$ 100,000.00
8	Excavation- Sand, Silt, Alluvium (Upper Pool)	8000	CY	$ 10.00	$ 80,000.00
9	Concrete	3300	CY	$ 450.00	$ 1,485,000.00
10	Sluice Gate	1	EA	$ 5,000.00	$ 5,000.00
11	Riprap	1100	TN	$ 50.00	$ 55,000.00
					$ 1,725,000.00
	Pipeline				
12	42" Concrete Pipe (inc. exc. & fill)	1825	LF	$ 250.00	$ 456,250.00
13	Pipe Crossing	215	LF	$ 625.00	$ 134,375.00
14	Energy Dissipating Structure	15	CY	$ 700.00	$ 10,500.00
					$ 601,125.00
	FISH LADDER				
15	Excavation- Sand, Silt, Alluvium	100	CY	$ 10.00	$ 1,000.00
16	Concrete (Walls & Baffles)	110	CY	$ 700.00	$ 77,000.00
17	Concrete (floor & footings)	55	CY	$ 350.00	$ 19,250.00
18	Flash Boards	385	LF	$ 3.00	$ 1,155.00
19	Keying, Drilling & Doweling	1	LS	$ 10,000.00	$ 10,000.00
					$ 108,405.00
	FISH SCREEN				
20	Excavation- Sand, Silt, Alluvium	100	CY	$ 10.00	$ 1,000.00
21	Concrete (Walls)	18	CY	$ 700.00	$ 12,600.00
22	Concrete (Slab & Footings)	60	CY	$ 350.00	$ 21,000.00
23	Gates & Brackets	2	EA	$ 5,000.00	$ 10,000.00
24	Return Pipe-2' Diameter Steel	200	LF	$ 225.00	$ 45,000.00
25	Flash Boards	40	LF	$ 3.00	$ 120.00
26	Screen (Johnson Wedge Wire)	200	SF	$ 60.00	$ 12,000.00
27	Working Platform	150	LF	$ 50.00	$ 7,500.00
28	Frame	1	LS	$ 6,500.00	$ 6,500.00
29	Electrical Control Unit	1	LS	$ 2,000.00	$ 2,000.00
30	Sheaves, Pulleys, Bearings Etc.	1	LS	$ 2,500.00	$ 2,500.00
31	Power Supply (Poles & Line)	4000	LF	$ 12.00	$ 48,000.00
32	Screen Installation (Labor)	1	LS	$ 65,000.00	$ 65,000.00
					$ 233,220.00
33	Gorge Blasting	700	CY	$ 50.00	$ 35,000.00
					$ 35,000.00
34	**Construction Cost**				**$ 3,463,000.00**
35	**Contingency @ 25%**				$ 866,000.00
36	**Construction Cost Subtotal**				**$ 4,329,000.00**
37	**Engineering @ 10%**				$ 433,000.00
38	**Environmental @ 2%**				$ 87,000.00
39	**Construction Inspection @ 10%**				$ 433,000.00
40	**Contract Admin @ 5%**				$ 216,000.00
41	**Total**				**$ 5,500,000.00**

Alternative 1a - Alternate Upstream Dam, Fish Ladder, Screen and Pipeline

Because the geologic exploration had raised questions about the potential for channel degradation and the associated issues at the Alternative 1 dam site, ND agreed to perform a very cursory investigation of another potential low head dam site about 4,600 ft. upstream of the Alternative 1 dam site. DWR, DFG, and a representative of Shea (a landowner at that site) met on November 3, 1997 to look at the Alternative 1a site.

Exposed bedrock across the low flow channel bottom at the proposed site indicated it had the potential for supporting a shorter low head dam which could be much less expensive and could avoid the potential liability of a taller dam at the Alternative 1 dam site. Excavation of two test pits near the Alternative 1 dam site had already been scheduled for that day, so the BLM excavator was asked to excavate a 2-ft. deep test pit at the north stream bank of the Alternative 1a site. The backhoe scraped through only about 0.5 ft. of cobbles before hitting bedrock, about 40 ft. from the north stream bank. The bedrock appeared to have sufficient compressive strength to support a small dam, but further geologic investigation would be necessary if this alternative is pursued.

A concrete overflow gravity dam about 6 ft. high would create about 4 ft. of head at the dam, cresting at an elevation high enough to provide the necessary conveyance slope to carry water to the existing diversion headworks. The length of the dam has not yet been determined. It would need to be between 250 ft. and 600 ft. long, depending on the stability of the south bank.

It may be possible to design an open ditch on the north side of the creek while remaining above the normal flood levels in most areas. Final designs should include investigation of a ditch on the north side, as well as a pipeline. If the ditch option is pursued, it could be lined with concrete and may need to incorporate a flume around the steep exposed bedrock hillside, about 300 ft. to 600 ft. upstream of Saeltzer Dam, as the ditch would be especially vulnerable to damage and would be difficult to maintain in that area.

If a concrete lined ditch is used for conveying water to the existing headworks, the potential cost savings at the Alternative 1a dam site over that of Alternative 1 could be about $1 million. If a pipeline is used for the entire length, the total project costs would be about the same as Alternative 1 costs.

Construction Summary

The Alternative 1a construction project would include:

- obtaining access easements
- improving the existing access roads
- clearing and grubbing the site

- dewatering the work site
- removing sediment above existing dam
- removing existing dam
- excavating for the new dam and ladder construction
- constructing a 400 to 900 cy concrete low head gravity dam about 6,600 ft. upstream of the existing dam
- constructing a 64-ft. long, 20-ft. wide pool & chute ladder within the dam
- constructing a 65-ft. long fish screen on the north bank
- constructing a concrete diversion structure w/headworks
- constructing a 42-in. dia., 6,600-ft. long diversion pipeline
- OR constructing a concrete lined ditch
- modifying the downstream gorge (see gorge modification section, p. 34)
- backfilling and completing site finish work and erosion control
- other miscellaneous work required to complete the project

Advantages and Disadvantages

Advantages:

- This alternative provides superior upstream fish passage
- Moving the dam upstream allows fish to recover from ascending the gorge before entering the fish ladder
- This alternative provides good downstream fish passage
- The potential liability associated with the existing dam would be eliminated
- Could improve bedload (fish spawning gravel) transport

Disadvantages:

- This could cost as much as the most expensive alternative (Table 1a)
- The new pipeline or ditch would increase maintenance requirements
- If an elevated pipe crossing was used, it could create potential liability
- If the channel re-routes away from the proposed dam, re-channeling of the creek would be required to maintain the diversion of water
- Construction of this alternative could be more complex than Alternatives 2 or 3 and may require two seasons for completion

PRELIMINARY COST ESTIMATE - ALTERNATIVE 1a

ITEM #	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST ($)	TOTAL COST If 400 cy dam ($)	TOTAL COST If 900 cy dam ($)
	MISCELLANEOUS					
1	Mobilization/Demobilization	1	LS	$ 60,000.00	$ 60,000.00	
2	Site Work, Access & Mitigation	1	LS	$ 100,000.00	$ 100,000.00	
3	Dewatering	1	LS	$ 150,000.00	$ 150,000.00	
4	Remove Existing Ladder	100	CY	$ 250.00	$ 25,000.00	
5	Remove Existing Dam	1500	CY	$ 150.00	$ 225,000.00	
6	Excavation-Pool Sediment	20000	CY	$ 10.00	$ 200,000.00	
7	Geologic Exploration	1	LS	$ 30,000.00	$ 30,000.00	
					$ 790,000.00	**$ 790,000.00**
	DAM					
8	Excavation- Sand, Silt, Alluvium (Dam)	10000	CY	$ 10.00	$ 100,000.00	
9	Excavation- Sand, Silt, Alluvium (Upper Pool)	8000	CY	$ 10.00	$ 80,000.00	
10	Concrete	(400-900)	CY	$ 450.00	$ 180,000.00	$ 405,000.00
11	Sluice Gate	1	EA	$ 5,000.00	$ 5,000.00	
12	Riprap	1100	TN	$ 50.00	$ 55,000.00	
					$ 420,000.00	**$ 645,000.00**
	Pipeline					
13	42" Concrete Pipe (inc. exc. & fill)	6600	LF	$ 250.00	$ 1,650,000.00	
14	Energy Dissipating Structure	15	CY	$ 700.00	$ 10,500.00	
					$ 1,660,500.00	**$ 1,660,500.00**
	FISH LADDER					
15	Excavation- Sand, Silt, Alluvium	100	CY	$ 10.00	$ 1,000.00	
16	Concrete (Walls & Baffles)	80	CY	$ 700.00	$ 56,000.00	
17	Concrete (floor & footings)	40	CY	$ 350.00	$ 14,000.00	
18	Flash Boards	385	LF	$ 3.00	$ 1,155.00	
19	Keying, Drilling & Doweling	1	LS	$ 10,000.00	$ 10,000.00	
					$ 82,155.00	**$ 82,155.00**
	FISH SCREEN					
20	Excavation- Sand, Silt, Alluvium	100	CY	$ 10.00	$ 1,000.00	
21	Concrete (Walls)	18	CY	$ 700.00	$ 12,600.00	
22	Concrete (Slab & Footings)	60	CY	$ 350.00	$ 21,000.00	
23	Gates & Brackets	2	EA	$ 5,000.00	$ 10,000.00	
24	Return Pipe-2' Diameter Steel	200	LF	$ 225.00	$ 45,000.00	
25	Flash Boards	40	LF	$ 3.00	$ 120.00	
26	Screen (Johnson Wedge Wire)	200	SF	$ 60.00	$ 12,000.00	
27	Working Platform	150	LF	$ 50.00	$ 7,500.00	
28	Frame	1	LS	$ 6,500.00	$ 6,500.00	
29	Electrical Control Unit	1	LS	$ 2,000.00	$ 2,000.00	
30	Sheaves, Pulleys, Bearings Etc.	1	LS	$ 2,500.00	$ 2,500.00	
31	Power Supply (Poles & Line)	4000	LF	$ 12.00	$ 48,000.00	
32	Screen Installation (Labor)	1	LS	$ 65,000.00	$ 65,000.00	
					$ 233,220.00	**$ 233,220.00**
33	Gorge Blasting	700	CY	$ 50.00	$ 35,000.00	
					$ 35,000.00	**$ 35,000.00**
34	**Construction Cost**				**$ 3,221,000.00**	**$ 3,446,000.00**
35	**Contingency @ 25%**				$ 805,000.00	$ 862,000.00
36	**Construction Cost Subtotal**				**$ 4,026,000.00**	**$ 4,308,000.00**
37	**Engineering @ 10%**				$ 403,000.00	$ 431,000.00
38	**Environmental @ 2%**				$ 81,000.00	$ 86,000.00
39	**Construction Inspection @ 10%**				$ 403,000.00	$ 431,000.00
40	**Contract Admin @ 5%**				$ 201,000.00	$ 215,000.00
41	**Total**				**$ 5,100,000.00**	**$ 5,500,000.00**

Alternative 2 - New Dam at Existing Saeltzer Dam Site and Left Bank Fish Ladder and Fish Screen

The major components of Alternative 2 are improving the existing access roads, dewatering the work site, dredging the sediment from above Saeltzer Dam, removing the existing dam, constructing the new dam at the same location, constructing a new fish ladder, diversion headworks and fish screen at the north side of the dam, and modifying the gorge below the dam.

The new dam would be constructed to allow for a north bank fish ladder and screen configuration, while eliminating the potential for catastrophic failure of the existing dam, which is cracked and leaking in several places. The north bank arrangement would be advantageous from an operations and maintenance standpoint, as access would be confined to one side of the creek. Replacement of the dam would reduce the potential for dam failure or failure that could be caused by constructing a ladder within the dam structure. Refer to the Initial Geologic Inspection Report (Appendix G). Although a new dam would need to be as high as the existing dam, the improved shape of the dam could decrease injuries to juvenile fish that spill over the dam.

The dam would be built with a 50-ft. wide notched spillway section, at the same elevation as the old dam spillway crest (555.25 ft.). The notched section would be next to the fish ladder to concentrate low flows near the ladder and provide extra attraction water near the ladder entrance during higher flows. The bedrock between the ladder entrance and the top of the gorge would be excavated to channel the flow from the ladder to the gorge, increasing the chances of upstream migrating adult fish "seeing" the ladder before approaching the dam. Also, downstream migrant juveniles, spilling over the notched portion of the dam, or screened out of the diversion and returned via a bypass pipe with an outlet into the ladder, would be channeled into the gorge. Predation of juveniles is less likely in the gorge than in the relatively slow-moving water in the pool at the dam base.

Also refer to the "Design and Construction Summary" section, p. 33, for more discussion.

Screen Sizing and Configuration

The fish screen design alternatives considered were:

1. On-stream screen
2. Off-stream screen

There were several reasons an off-stream screen design was chosen for this site. First, an on-stream fish screen could have very high operation and maintenance requirements and costs because of susceptibility to high flow damage. Second, building a protective structure and increasing the screen frame structural strength

would add to the initial cost. Third, TFWDC has the right to divert water year-round. So the great fluctuations in the creek flows and stage would mean the height of the screen would have to be much greater if it were on-stream than if it were built behind the headworks where the water level would be regulated. Finally, there are adequate flows to provide water for the bypass pipe.

The proposed preliminary fish screen design would pass the required 55 cfs design flow while meeting the California DFG Statewide Fish Screening Policy design requirements for salmon and NMFS slot width criteria for steelhead. The calculated sweeping velocity of 2.2 ft./sec. exceeds the criteria of "two times approach velocity". Although in-ditch fish screen design requirements allow for a maximum approach velocity of 0.40 ft./sec. for continually cleaned screens, the more conservative criteria of .33 ft./sec. for on-stream screens was used because of the added benefits and small extra cost. The continually cleaning screen would be constructed in the ditch as shown on Sheets 6 and 8.

With a maximum allowable approach velocity of 0.33 ft./sec. for continually cleaned screens and a maximum design flow of 55 cfs, the required wetted screen area is 165 sq.ft. (55 cfs/0.33 ft./sec). Adding 40 sq. ft. to the required area to compensate for reduction of screen area due to structural members, the required screen area is thus 205 sq. ft. The screen length was determined based on the water surface elevation in the ditch (elev. 555.2 ft.) when diverting the maximum water right of 55 cfs plus the 10 cfs return flow. With the screen slab at elevation 552.4 ft., the wetted vertical depth of the screen is 2.75 ft. With the screens tilted at 30 degrees from vertical, the wetted screen depth is 3.18 ft. Dividing the required screen area by the wetted depth (205 sq.ft./3.18 ft) yields a required screen length of 64.5 ft. Therefore, a 65-ft. long screen would be constructed.

The proposed screen would have a reinforced concrete foundation and be protected by the headworks structure and flood wall. Frame supports would be spaced at 5-ft. intervals and attached to the foundation. The frame system would support removable Johnson wedgewire or equivalent screen panels meeting DFG's fish screen criteria. The screen height is designed to allow 0.5 ft. of freeboard, which would be adequate except in extreme flood events in which the headworks structure may be overtopped. All fish screen panels would be attached to the structural members such that they could be removed for maintenance purposes. It was assumed that Johnson wedge wire would be used as the screen face material for cost estimating purposes.

The screen would be cleaned by a continuously sweeping brush, powered by an electric motor, or an acceptable alternative cleaning system. A concrete access ramp may need to be constructed from the county road to the screen area to allow access for maintenance activities.

Screen Operation and Maintenance

Operation and maintenance would be performed by TFWDC personnel and checked occasionally by DFG. Operational requirements would include assurance that the screen cleaning equipment is functioning properly. Maintenance responsibilities include the replacement of the brushes and other parts when they wear out. Occasional cleaning of sediment from the screen bay might be necessary.

Ladder Sizing and Configuration

DWR began the fish ladder design process by performing a hydrological analysis of flow records from the Igo gage located about four miles upstream of Saeltzer Dam. The analysis included calculation of monthly exceedances, a three-day delay flow frequency analysis, and a relative frequency analysis (Appendix D). The 23-year, pre-Whiskeytown Dam period and the 33-year, post-Whiskeytown Dam period were analyzed.

It was determined that with an 80 cfs fish ladder, fish would be delayed for more than three days only about once every 3-1/2 years, on average. The 80 cfs is based on an 800 cfs three-day delay flow and the desire to have a minimum of 10 percent of the total creek flow going through the ladder when total flow is less than the delay flow.

Several fish ladder designs were considered for improving passage for target species spring-run chinook salmon and steelhead while considering other species as well. During the design process, scoping team members discussed and analyzed the step pool, vertical slot, denil, and pool and chute type ladders while considering numerous factors including fish passage, owner liability, operation and maintenance, available water rights, location and condition of existing facilities, stream characteristics, stream hydrology, biological criteria, and availability of funding. The denil was ruled out because of its flow capacity limitation. The vertical slot was also ruled out because of limited flow capacity and general observations of increased susceptibility to plugging with debris than other types due to relatively narrow slot openings. The pool and chute type ladder design was discarded because of head differential limitations. With the proposed dam having an upstream pool to tailwater head differential of more than 15 ft., the high velocity chute design could result in unstable flow conditions. Those conditions could set up oscillations in the ladder, making the ladder potentially impassable. With these and other ladder types ruled out, the proven, reliable, and relatively low-maintenance step pool type ladder was selected.

ND engineers performed a hydraulic analysis to determine the step pool ladder dimensions, baffle size and configuration, orifice dimensions, and critical upstream and downstream ladder invert elevations. The minimum pool size was determined using the energy dissipation requirements of four ft.-lbs./sec./cu. ft. of water in the pool (i.e., required pool volume of "V = 16 x Q x h"). The ladder would have an operating range between 17 and 80 cfs while remaining in a plunging flow regime. The ladder would

have 15 baffles, each 15 ft. wide which would pass about 50 cfs with 1 ft. of head. With the addition of two 20-in. x 20-in. orifices, each with a capacity of 15 cfs, the total flow in the ladder would be about 80 cfs. The notched dam would provide attraction flows as described above.

Studies have shown that some fish prefer orifices to baffles. The orifices would allow the fish to ascend or descend the ladder without jumping over the baffles. Also, the orifices would help pass sediment through the ladder, decreasing maintenance requirements.

The baffles would be chamfered on the downstream side. The orifices would be chamfered on the upstream and downstream sides. The velocities through the orifices would be limited to about 8 ft./sec. at 1 ft. of head. When the orifices are closed with wooden flashboards, the ladder could be operated at flows as low as 17 cfs while maintaining 6 in. of water depth over the weir. Baffle orifices would be opened or closed, depending on flow conditions, to provide at least 6 in. of head over the weirs at all times. If flows in the main channel are low, the upstream orifice would be partially closed and one or both orifices in each of the baffles may need to be closed to force flows over the weirs. Baffle orifices would only be open if they would remain fully submerged when opened.

The fish ladder entrance pool (for upstream migrants) was designed with two orifice/headgates that would attract fish under varying flow conditions. The orifices are designed to operate with 1 ft. of head differential, so attraction jet velocities would be about 8 ft./sec. Only one of the orifices would be open at any given time.

The upstream pool orifice/headgate (upstream migrant fish exit) is designed such that when the pool water surface elevation is at the dam crest elevation of 555.25 ft. and the headgate is fully opened, the flow in the ladder would be 80 cfs. The headgate would be partially closed during higher creek flow periods to maintain a maximum of about 1 ft. of water depth over the baffle weirs to prevent streaming flows. The upper pool exit orifice is located far enough upstream to prevent fish from being swept back over the dam.

A trash rack at the upstream flow entrance would protect the ladder. The entire ladder would be covered with steel grating to prevent large debris, people, and animals from entering the ladder.

Ladder Operation and Maintenance

Operational requirements would include cleaning debris from the ladder, including orifices, weirs and the trash rack. Orifice headgates would need to be adjusted occasionally. The baffle orifices may need to be closed during extremely low flow conditions, and the upstream headgate should be closed during flood events.

Construction Summary

Construction of Alternative 2 would include:

- obtaining access easements
- obtaining a road encroachment permit
- improving the existing access roads
- clearing and grubbing the site
- dewatering the work site
- removing sediment above existing dam
- removing the existing dam
- excavating for the new ladder and screen construction
- constructing the new dam and fish ladder
- installing steel grating over the ladder
- constructing the new diversion headworks and fish screen
- installing the fish bypass pipe
- modifying the gorge (see gorge modification section, p. 34)
- backfilling and completing site finish work and erosion control
- other miscellaneous work required to complete the project

Advantages and Disadvantages

Advantages:

- This alternative provides a good fish passage solution as the fishway can be tailored to fit the site
- TFWDC would get a new dam without having to change the point of diversion, which would potentially increase O & M requirements
- The liability associated with potential dam failure would be decreased with the construction of a new dam

Disadvantages:

- This is a relatively expensive alternative (Table 2)
- Passage characteristics of the high head ladder are believed to be inferior to the potential low head fish ladder at the upstream site
- The potential liability associated with a 15-ft. high dam would remain with both DFG and TFWDC
- A disadvantage is that DFG owns the land on which the existing dam lies and wants to sell or trade the land to BLM. BLM indicated that they will reject the deal if the existing dam remains in place. This matter may not be an issue if BLM is comfortable with a new dam

PRELIMINARY COST ESTIMATE - ALTERNATIVE 2

ITEM #	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST ($)	TOTAL COST ($)
	MISCELLANEOUS				
1	Mobilization/Demobilization	1	LS	$ 60,000.00	$ 60,000.00
2	Site Work, Access & Mitigation	1	LS	$ 80,000.00	$ 80,000.00
3	Dewatering	1	LS	$ 125,000.00	$ 125,000.00
4	Remove Existing Ladder	100	CY	$ 250.00	$ 25,000.00
5	Remove Existing Dam	1500	CY	$ 150.00	$ 225,000.00
6	Remove Existing Concrete Diversion	55	CY	$ 150.00	$ 8,250.00
7	Excavation-Pool Sediment	20000	CY	$ 10.00	$ 200,000.00
8	Excavation-Channel Modification	1200	CY	$ 175.00	$ 210,000.00
					$ 933,250.00
	DAM				
9	Sluice Gate	1	EA	$ 5,000.00	$ 5,000.00
10	Concrete	1350	CY	$ 500.00	$ 675,000.00
					$ 680,000.00
	FISH LADDER				
11	Excavation-Bedrock	380	CY	$ 175.00	$ 66,500.00
12	Concrete (Walls & Baffles)	190	CY	$ 700.00	$ 133,000.00
13	Concrete (floor)	140	CY	$ 350.00	$ 49,000.00
14	Gates & Brackets	1	LS	$ 20,000.00	$ 20,000.00
15	Grating	3000	SF	$ 20.00	$ 60,000.00
16	Flash Boards	270	LF	$ 3.00	$ 810.00
17	Keying, Drilling & Doweling	1	LS	$ 10,000.00	$ 10,000.00
					$ 339,310.00
	FISH SCREEN				
18	Excavation- Sand, Silt, Alluvium	50	CY	$ 10.00	$ 500.00
19	Concrete (Walls)	18	CY	$ 700.00	$ 12,600.00
20	Concrete (Slab & Footings)	60	CY	$ 350.00	$ 21,000.00
21	Concrete (Flood Wall)	15	CY	$ 700.00	$ 10,500.00
22	Gates & Brackets	2	EA	$ 5,000.00	$ 10,000.00
23	Return Pipe-2' Diameter Steel	16	LF	$ 200.00	$ 3,200.00
24	Flash Boards	40	LF	$ 3.00	$ 120.00
25	Screen (Johnson Wedge Wire)	200	SF	$ 60.00	$ 12,000.00
26	Working Platform	150	SF	$ 50.00	$ 7,500.00
27	Frame	1	LS	$ 6,500.00	$ 6,500.00
28	Electrical Control Unit	1	LS	$ 2,000.00	$ 2,000.00
29	Sheaves, Pulleys, Bearings Etc.	1	LS	$ 2,500.00	$ 2,500.00
30	Power Supply (Poles & Line)	5300	LF	$ 12.00	$ 63,600.00
31	Screen Installation (Labor)	1	LS	$ 65,000.00	$ 65,000.00
					$ 217,020.00
32	Gorge Blasting	700	CY	$ 50.00	$ 35,000.00
					$ 35,000.00
33	**Construction Cost**				**$ 2,205,000.00**
34	**Contingency @ 25%**				$ 551,000.00
35	**Construction Cost Subtotal**				**$ 2,756,000.00**
36	**Engineering @ 15%**				$ 413,000.00
37	**Environmental @ 2%**				$ 55,000.00
38	**Construction Inspection @ 15%**				$ 413,000.00
39	**Contract Admin @ 5%**				$ 138,000.00
40	**Total**				**$ 3,800,000.00**

Alternative 3 - Right Bank Fish Ladder

The major components of Alternative 3 are improving the existing access roads, removing a portion of the existing covered fish ladder, constructing a new fish ladder and auxiliary water pipe around the south side of the dam, and modifying the gorge below the dam. Work could include low pressure grouting of the cracks in the existing dam.

Also refer to the "Design and Construction Summary", p. 33, for more discussion.

Fish Screen

It was decided that since TFWDC normally diverts less than 25 cfs into the ditch and the present screen has a capacity of 25 cfs while meeting current screen design criteria, no modification to the existing fish screen structure would be needed for this alternative. DFG currently has an agreement to maintain the fish screen which was constructed by DFG in 1992 at the head of the Townsend Ditch, so DFG has agreed to update the screen if TFWDC decides to start diverting more water than they have taken in recent years.

Ladder Sizing and Configuration

DWR began the fish ladder design process by performing a hydrological analysis of flow records from the Igo gage which is located about four miles upstream of Saeltzer Dam. The analysis included calculation of monthly exceedances, a three-day delay flow frequency analysis, and a relative frequency analysis (Appendix D). The 23-year pre-Whiskeytown Dam period and the 33-year post-Whiskeytown Dam period were analyzed.

It was determined that with an 80 cfs fish ladder, fish would be delayed for more than three days only about once every 3-1/2 years, on average. The 80 cfs is based on an 800 cfs three-day delay flow and the desire to have a minimum of 10 percent of the total creek flow going through the ladder when total flow is less than the delay flow.

Several fish ladder designs were considered for improving passage for target species spring-run chinook salmon and steelhead while considering other species as well. During the design process, scoping team members discussed and analyzed the step pool, vertical slot, denil, and pool and chute type ladders while considering numerous factors including fish passage, owner liability, operation and maintenance, available water rights, location and condition of existing facilities, stream characteristics, stream hydrology, biological criteria, and availability of funding. The denil was ruled out because of its flow capacity limitation. The vertical slot was also ruled out because of limited flow capacity and general observations of increased susceptibility to plugging with debris than other types due to relatively narrow slot openings. The pool and chute type ladder design was discarded because of head

differential limitations. With Saeltzer Dam having an upstream pool to tailwater head differential of more than 15 ft., the high velocity chute design could result in unstable flow conditions. Those conditions could set up oscillations in the ladder, making the pool and chute ladder potentially impassable. With these and other ladder types ruled out, the proven, reliable, and relatively low maintenance step pool type ladder was selected.

ND engineers performed a hydraulic analysis to determine the step pool ladder dimensions, baffle size and configuration, orifice dimensions, and critical upstream and downstream ladder invert elevations. The minimum pool size was determined using the energy dissipation requirements of four ft.-lbs./sec./cu. ft. of water in the pool, (i.e., required pool volume of "V = 16 x Q x h"). The ladder would have an operating range between 17 and 80 cfs while remaining in a plunging flow regime. The ladder would have 15 baffles, each 15 ft. wide which would pass about 50 cfs with 1 ft. of head. With the addition of two 20 in. x 20 in. orifices, each with a capacity of 15 cfs at 1 ft. of head, the total flow in the ladder would be about 80 cfs.

The baffles would be chamfered on the downstream side. The orifices would be chamfered on the upstream and downstream sides. The velocities through the orifices would be limited to about 8 ft./sec. at 1 ft. of head. When the orifices are closed with wooden flashboards, the ladder can be operated at flows as low as 17 cfs while maintaining 6 in. of water depth over the weir. Baffle orifices would be opened or closed, depending on flow conditions, to provide at least 6 in. of head over the weirs at all times. If flows in the main channel are low, the upstream orifice would be partially closed and one or both orifices in each of the baffles may need to be closed to force flows over the weirs. Baffle orifices would only be open if they would remain fully submerged when opened.

The fish ladder entrance pool for upstream migrants (downstream end) was designed with two orifice/headgates that would attract fish under varying flow conditions. The orifices are designed to operate with 1 ft. of head differential, so attraction jet velocities would be about 8 ft./sec. Only one of the orifices would be open at any given time.

The upstream pool orifice/headgate (upstream migrant fish exit) is designed such that when the pool water surface elevation is at the dam crest elevation of 555.25 ft. and the headgate is fully opened, the flow in the ladder would be 80 cfs. The headgate would be partially closed during higher creek flow periods to maintain a maximum of about 1 ft. of water depth over the baffle weirs to prevent streaming flows. The upper pool exit orifice is located far enough upstream to prevent fish from being swept back over the dam.

A trash rack at the upstream end flow entrance would protect the ladder. The entire ladder would be covered with steel grating to prevent large debris, people, and animals from entering the ladder.

Although a three-day delay flow analysis determined that a design flow of 80 cfs in the ladder would pass fish effectively most of the time, an auxiliary water pipe that would provide a concentrated flow jet of up to 120 cfs near the ladder entrance was

incorporated to enhance the attraction characteristics of the ladder. Also, the extra flow makes it more comparable to the flow handling capability of the Alternative 1 fish ladder, the pool and chute type.

Ladder Operation and Maintenance

Operational requirements would include cleaning debris from the ladder, including orifices, weirs and trash rack. Orifice headgates would need to be adjusted occasionally. Baffle orifices may need to be closed during extremely low flow conditions and the upstream headgate should be closed during flood events.

Construction Summary

Construction of this project would include:

- obtaining access easements
- improving the existing access roads
- clearing and grubbing the site
- dewatering the work site
- removing 130 ft. of the existing fish ladder/tunnel
- excavating for the new ladder construction
- forming and placing concrete for the new ladder
- installing steel grating over the ladder
- modifying the gorge (see gorge modification section, p. 34)
- backfilling and completing site finish work and erosion control
- other miscellaneous work required to complete the project

Advantages and Disadvantages

Advantages:

- This is the least expensive alternative (Table 3)
- This alternative provides good upstream fish passage
- This alternative provides good downstream fish passage
- Construction could be accomplished relatively easily and in one season

Disadvantages:

- Passage characteristics of the high head ladder are believed to be inferior to the potential low head fish ladder at the upstream site
- Risk of injury to fish spilling over the existing 15-ft. high dam is greater than it would be over a properly designed, low head dam
- The potential liability associated with the existing dam would remain with both DFG and TFWDC

PRELIMINARY COST ESTIMATE - ALTERNATIVE 3

ALTERNATIVE 3

ITEM #	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST ($)	TOTAL COST ($)
	MISCELLANEOUS				
1	Mobilization/Demobilization	1	LS	$ 40,000.00	$ 40,000.00
2	Site Work, Access & Mitigation	1	LS	$ 50,000.00	$ 50,000.00
3	Dewatering	1	LS	$ 75,000.00	$ 75,000.00
4	Remove Existing Ladder	100	CY	$ 250.00	$ 25,000.00
					$ 190,000.00
	FISH LADDER				
5	Excavation- Sand, Silt, Alluvium	1600	CY	$ 10.00	$ 16,000.00
6	Excavation- Bedrock	1520	CY	$ 175.00	$ 266,000.00
7	Concrete (Walls & Baffles)	235	CY	$ 700.00	$ 164,500.00
8	Concrete (floor)	155	CY	$ 350.00	$ 54,250.00
9	Gates & Brackets	4	EA	$ 5,000.00	$ 20,000.00
10	Grating	3800	SF	$ 20.00	$ 76,000.00
11	Flash Boards	270	LF	$ 3.00	$ 810.00
12	Keying, Drilling & Doweling	1	LS	$ 10,000.00	$ 10,000.00
13	Auxillary Pipeline	200	LF	$ 200.00	$ 40,000.00
					$ 647,560.00
14	Gorge Blasting	700	CY	$ 50.00	$ 35,000.00
					$ 35,000.00
15	**Construction Cost**				**$ 873,000.00**
16	**Contingency @ 25%**				$ 218,000.00
17	**Construction Cost Subtotal**				**$ 1,091,000.00**
18	**Engineering @ 15%**				$ 164,000.00
19	**Environmental @ 2%**				$ 22,000.00
20	**Construction Inspection @ 15%**				$ 164,000.00
21	**Contract Admin @ 5%**				$ 55,000.00
22	**Total**				**$ 1,500,000.00**

Design and Construction Summary

General

The proposed dams for Alternatives 1, 1a, and 2 would be concrete overflow gravity dams anchored to bedrock with dowels. The dam crest would have a 2-ft. wide flat top which would transition over a smooth ogee shape to the downstream sloping face, as shown in the drawings. The upstream edge of the crest would be rounded. The downstream ogee shaped crest would prevent flowing water from separating from the dam face, thus prolonging the life of the dam while decreasing injuries to juvenile fish that spill over the dam.

Fish ladder baffles and orifices would be chamfered as shown in the preliminary drawings (Sheets 1-14) to improve hydraulic performance of the ladder and help prevent injury to fish. Exposed corners of all concrete structures would be chamfered 3/4 in. Sidewalls of the selected ladder could consist of bedrock, for cost efficiency, if it is at least as durable as 4,000 psi concrete and could be excavated in a manner that would not adversely affect ladder hydraulics.

If Alternative 1 or 1a is approved, construction may need to be performed over two construction seasons. The upstream diversion headworks, fish screen, and pipeline or ditch, and possibly part of the new dam could be constructed the first season. The new diversion could be used to help dewater the work area and deliver water to TFWDC during the next construction season. The second construction period would include erecting the dam (or remainder), and all the other work listed under Alternative 1.

At the Saeltzer Dam project site, construction equipment access is proposed along one or more existing dirt roads connected to paved county roads (Figure 3). Staging areas would be located in open areas to minimize environmental impacts. The limits of the staging areas and access routes would be marked and managed to prevent vehicular access outside the designated zones. The access routes and staging areas proposed were selected to minimize impacts to riparian vegetation.

The construction of access roads, ramps, and staging areas is expected to temporarily remove some riparian vegetation. After completion of work, access ramps on streambanks would be graded to conform to the surrounding contours. Road construction, staging areas and access ramps would be graded and seeded with native grasses after completion of work to prevent erosion. All removed riparian vegetation would be salvaged and re-established or replaced. No long term change in diversion quantity would result from the project.

Temporary cofferdams would be constructed around portions of the construction areas. If gravel, rather than sheetpile or other types of cofferdams are constructed, spawning gravel (consisting of washed river gravels between 1/4 in. and 4 in. diameter) would be spread in the stream channel upon completion of the construction activities.

The area behind the temporary cofferdams would be dewatered prior to and during construction activities. Fluids removed during the de-watering operation would be pumped into the diversion ditch or through settling basins to prevent highly turbid water from entering the creek. Water would be provided to the ditch during the construction period. Gravels and concrete excavated from the construction zone would be hauled off-site.

The project is designed to avoid significant changes in stream channel hydrology and channel capacity. All proposed in-water construction activities should be limited to the period from July 1 through October 15 to minimize fishery impacts.

Gorge Modification

The selected alternative would include work to improve fish passage through the steep gorge that begins about 130 ft. downstream of the dam and drops about 25 ft. in elevation over the next 200 ft. DWR surveyed the gorge to document the existing condition. Improving fish passage through the steep gorge area below the dam would be accomplished through widening the channel, evening out the slope, and eliminating large drops between pools in the gorge. This would be accomplished by controlled blasting of the rock walls and by blasting and moving large boulders that are impeding passage (Sheet 6).

Water can be diverted around the steep gorge modification work site and returned to the creek via the diversion ditch and/or the existing underground ladder/tunnel.

The rock walls would be blasted vertically down to the thalweg of the gorge or to the elevation needed to eliminate the large drops in water surface elevation. The proposed finished width of the steep gorge is about 30 ft., similar to the gorge width downstream. The total volume of rock to be moved would be about 700 cy. The blasted rock would be positioned in the channel such that maximum drops between pools would be limited to about two ft. The blasting work would be directed by Mr. Phil Warner, DFG Region 1, and would be performed under the same contract as the dam passage work. All appropriate permits would need to be obtained.

Sediment and Dam Removal

Alternatives 1, 1a, and 2 would include the removal of sediment from the Saeltzer Dam reservoir pool and the demolition and removal of Saeltzer Dam.

About 20,000 cy of sediment would need to be dredged from above Saeltzer Dam prior to the removal of the existing dam. The sediment removal would be accomplished as described below and as shown on Page 5 of the 1993 Clear Creek Fisheries Habitat Restoration Biological Assessment (Appendix A).

A diversion would be constructed across the creek to divert flows around the dredging and dam removal work. A bypass channel would be completed by excavating gravel at the upstream and downstream ends of the partially constructed channel (Sheet 2). The diversion and channel would provide water to the TFWDC ditch during construction and help reduce downstream turbidity. Most of the channel was excavated in March, 1997 in preparation for the proposed sediment dredging project (Appendix A), which has been shelved at this time. Results of tests performed on materials excavated upstream of Saeltzer Dam are contained in Appendix A.

Dam removal would be accomplished through blasting and/or the use of hydraulic hoe rams and excavators. All concrete materials would be hauled off site and disposed of in accordance with applicable laws.

Dredging and dam removal activities may result in the temporary loss of some streamside vegetation (1/8 to 1/4 acre) at equipment access ramps. These losses would be kept to a minimum by constructing single paths 15 to 30 ft. wide through existing riparian corridors in areas where damage to vegetation cannot be avoided. Disturbed areas would be revegetated with appropriate native grass species to prevent erosion.

Site Conditions and Assumptions

The preliminary layout and conceptual drawings presented as Sheets 1 through 14 will be a foundation for final designs. The final design engineer should review the Geologic Feasibility Report (Appendix H) and perform a thorough site examination prior to proceeding with final designs. DWR could not locate Saeltzer Dam as-built drawings, so the shape of the upstream dam face was assumed to continue at the same slope as the observable portion (the upper few feet). Thus, the quantity of concrete and other materials to be removed could vary significantly from the estimated quantity. Also, additional surveying could be necessary due to changes in site conditions since initial surveys were completed.

The preliminary cost estimates for design and construction were based on preliminary engineering drawings and current construction costs. The cost estimates shown are preliminary and are not intended for bidding purposes as the final cost estimates may change depending upon specifications, changes, and additions made by the final design engineer.

Note: On January 1, 1997, the flow in Clear Creek near Igo peaked at about 14,600 cfs. About 100 ft. upstream of Saeltzer Dam, debris from the high water line was observed at elevation 562.7 ft. (7.5 ft. above the top of the dam). At the Alternative 1 dam site, debris was observed at elevation 569.0 ft. (about 7 ft. above the top of the proposed dam and approximate top of the existing gravel bar).

Codes and Standards

Final designs will be governed by the following criteria:

- Final designs shall comply with the current Reclamation Board Standards
- Final structural designs shall comply with the 1997, or latest, Uniform Building Code requirements
- Final concrete designs shall comply with the 1995, or latest, American Concrete Institute Building Code Requirements for Reinforced Concrete Design
- Final electrical designs shall comply with the 1996, or latest, National Electrical Code
- All current applicable CalOSHA safety standards must be met
- All environmental permit conditions must be met (see the environmental checklist, Table 4, and Appendices A, I, and J)

Final Design Criteria

The final designs must be approved by DFG and will be reviewed by NMFS.

Final fish screen designs must comply with California DFG Statewide Fish Screening Policy and NMFS criteria.

The following fish screen criteria must be met:

Department of Fish and Game and National Marine Fisheries Service Fish Screening Criteria

Salmon and Steelhead	
Approach Velocity	.....0.33 ft./sec. (on-stream, continually cleaned screens)
Approach Velocity	.....0.40 ft./sec. (in-canal, continually cleaned screens)
Approach Velocity	..... 0.0825 ft./sec. (on-stream, non-continually cleaned screens)
Approach Velocity	..... 0.10 ft./sec. (in-canal, non-continually cleaned screens)
Sweeping Velocity	..... V >2xApproach Vel.(on-stream) (NMFS: V >approach vel.)
Sweeping Velocity	..... V > Approach Vel.(in-canal) (NMFS: V > approach vel.)
Slotted Openings	..... 0.0689 in. max.
Round Openings	..... 3/32 in. max.
Square Openings	..... 3/32 in. max. (Measured diagonally)
Net Open Area	..... > 27 percent

Final Design Instructions

The elevations shown on Sheets 1-14 are based on the NGVD 1929 datum. Descriptions and elevations of control points can be obtained from N.D.

Concrete wall and slab thicknesses shown on drawings are minimums. Actual concrete thickness and reinforcement requirements will be determined by the final design engineer.

Cutoff wall/footing dimensions shown on drawings are approximate. Actual dimensions will be determined by the final design engineer.

If one of the alternatives is constructed, the following items shown on the Preliminary Engineering drawings, Sheets 1 - 14, shall not be changed without approval of DFG and DWR:

1. Top elevations of the fish ladder slabs, baffles and walls
2. Top elevation of the fish screen slab
3. Baffle dimensions and minimum spacing
4. Baffle weir dimensions and configuration
5. Orifice dimensions and chamfer sizes

Proposed pipeline sizes and locations are approximate. Actual dimensions and locations will be determined by the final design engineer. The new pipeline or ditch, if constructed, must be constructed in accordance with California Reclamation Board standards.

Fish screen structural member dimensions are approximate. Actual dimensions will be determined by the final design engineer. The screen length shown may be adjusted depending on size, spacing and number of structural members, which will be determined by the final design engineer.

All fish screen panels would be attached to the structural members such that they can be removed for maintenance purposes.

The screen would be cleaned by a continually sweeping brush, powered by an electric motor and control unit, or acceptable alternative as determined by DFG.

Protection of the fish ladders, screens and appurtenant structures during high flows should be considered during the final design process.

Construction planning should recognize that TFWDC may need their Clear Creek water rights during the construction period.

The configuration of the flow control baffles for the fish screen may change. The final design could have the baffles as close to the screen as possible, but will still require approval by DFG and DWR.

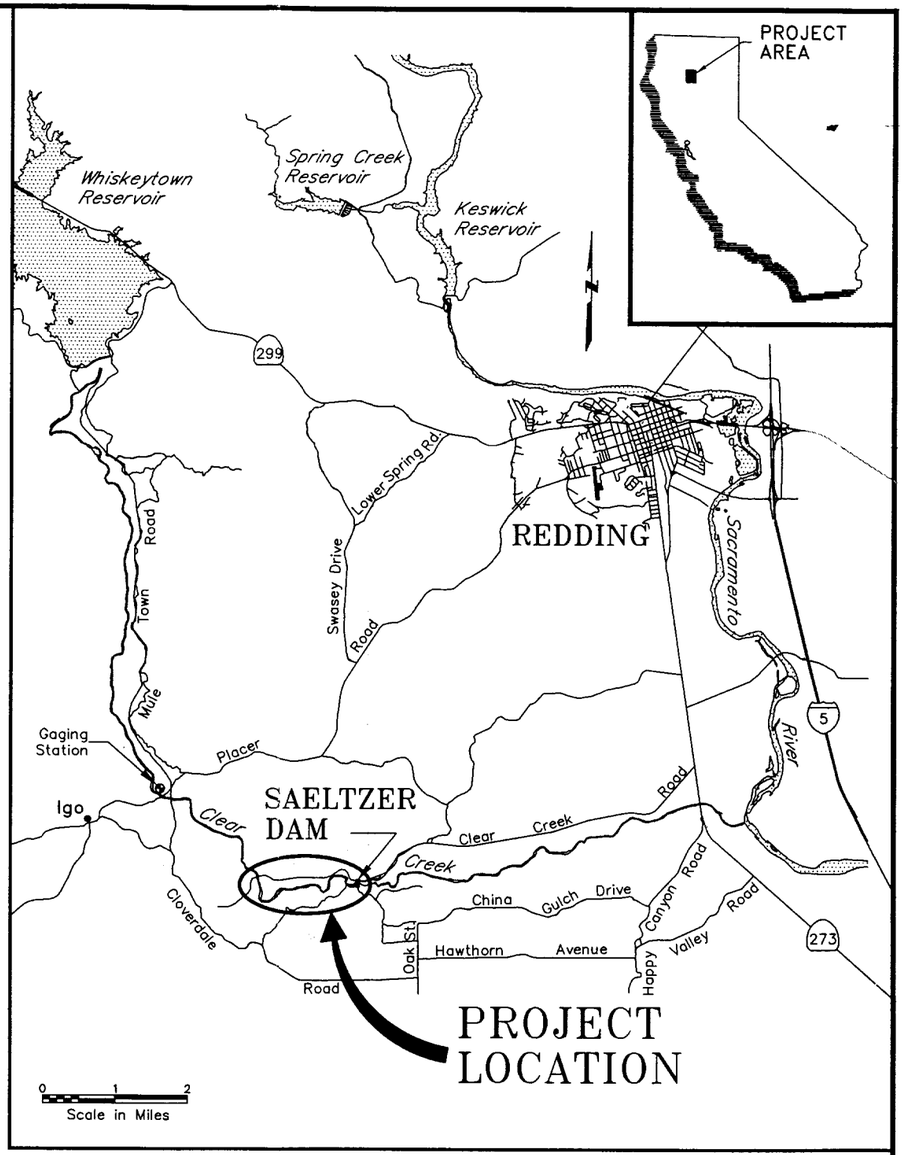
Questions regarding preliminary engineering drawings, environmental issues, or fish screen criteria may be directed to DFG.

PRELIMINARY ENGINEERING DRAWINGS FOR

SAELTZER DAM FISH PASSAGE PROJECT ON CLEAR CREEK

DRAFT

SHASTA COUNTY CALIFORNIA

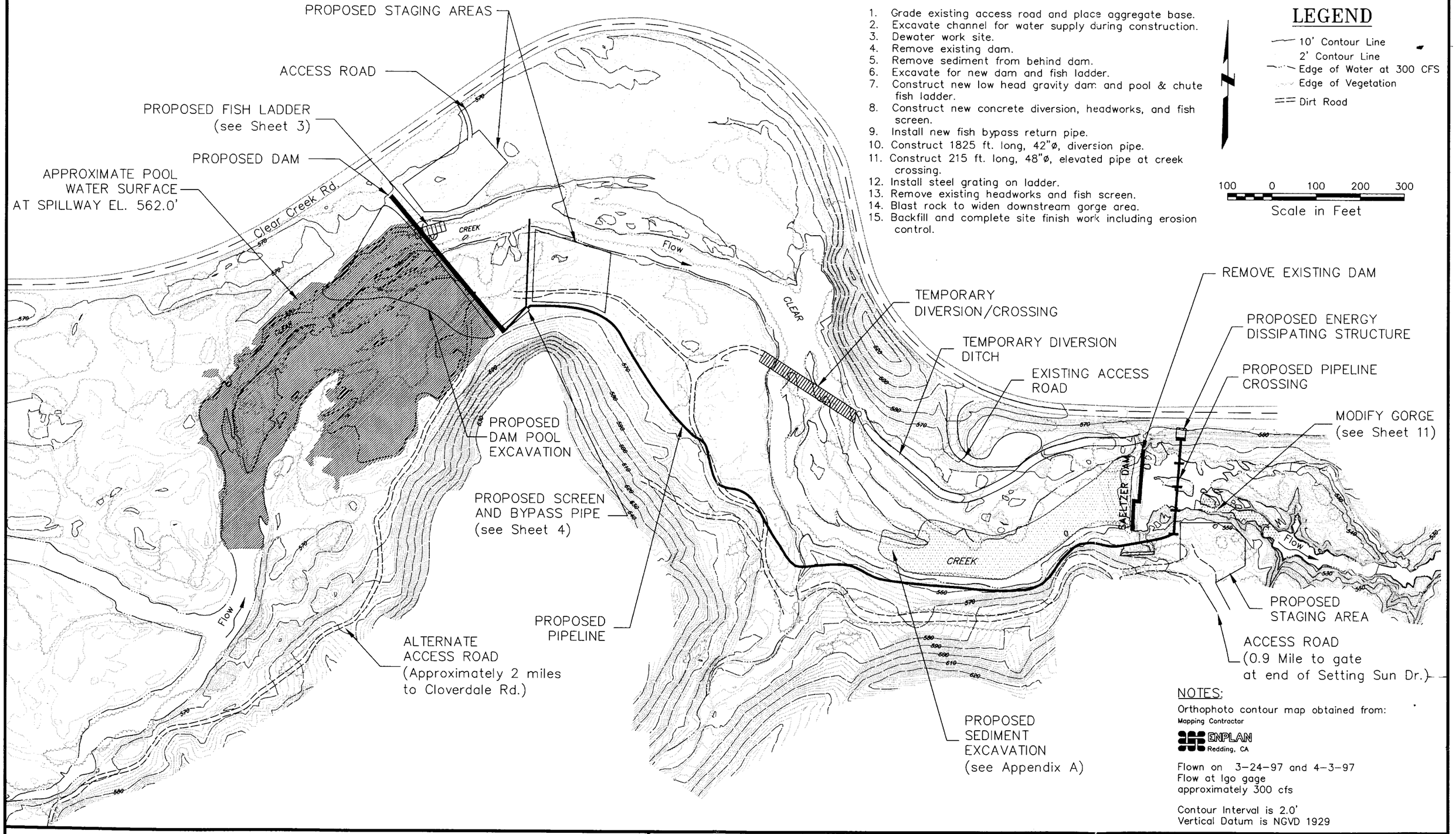


INDEX OF SHEETS

Note: Refer to Preliminary Engineering Technical Report for final design instructions.

PRELIMINARY
SUBJECT TO REVISION

SAELTZER DAM FISH PASSAGE PROJECT Clear Creek near Redding, California	Title Page and Location Map	STATE OF CALIFORNIA THE RESOURCES AGENCY DEPARTMENT OF WATER RESOURCES NORTHERN DISTRICT	DRAWING : SDSHT1
		Revision Date: December 19, 1997	Sheet 1 of 14



1. Grade existing access road and place aggregate base.
2. Excavate channel for water supply during construction.
3. Dewater work site.
4. Remove existing dam.
5. Remove sediment from behind dam.
6. Excavate for new dam and fish ladder.
7. Construct new low head gravity dam and pool & chute fish ladder.
8. Construct new concrete diversion, headworks, and fish screen.
9. Install new fish bypass return pipe.
10. Construct 1825 ft. long, 42"ø, diversion pipe.
11. Construct 215 ft. long, 48"ø, elevated pipe at creek crossing.
12. Install steel grating on ladder.
13. Remove existing headworks and fish screen.
14. Blast rock to widen downstream gorge area.
15. Backfill and complete site finish work including erosion control.

LEGEND

- 10' Contour Line
- 2' Contour Line
- Edge of Water at 300 CFS
- Edge of Vegetation
- Dirt Road

100 0 100 200 300
Scale in Feet

NOTES:

Orthophoto contour map obtained from:
Mapping Contractor
ENPLAN
Redding, CA

Flown on 3-24-97 and 4-3-97
Flow at Igo gage
approximately 300 cfs

Contour Interval is 2.0'
Vertical Datum is NGVD 1929

SAELTZER DAM FISH PASSAGE PROJECT

Clear Creek near Redding, California

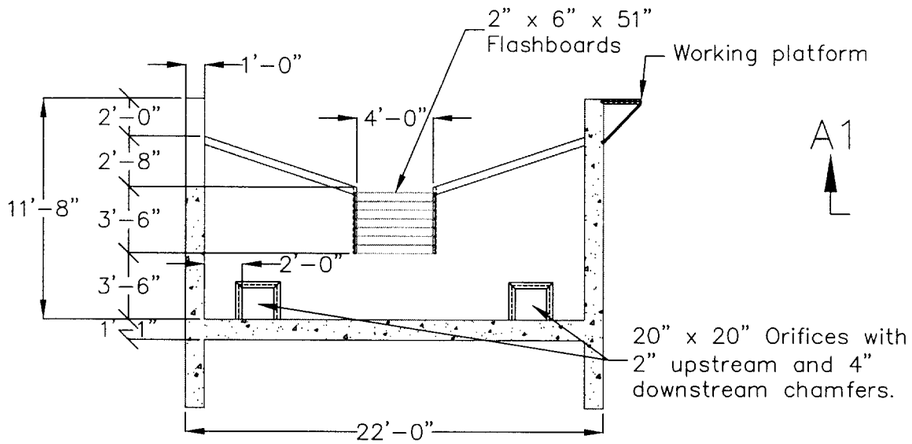
Alternative 1 Site Plan

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
NORTHERN DISTRICT

DRAWING : SDSHT2

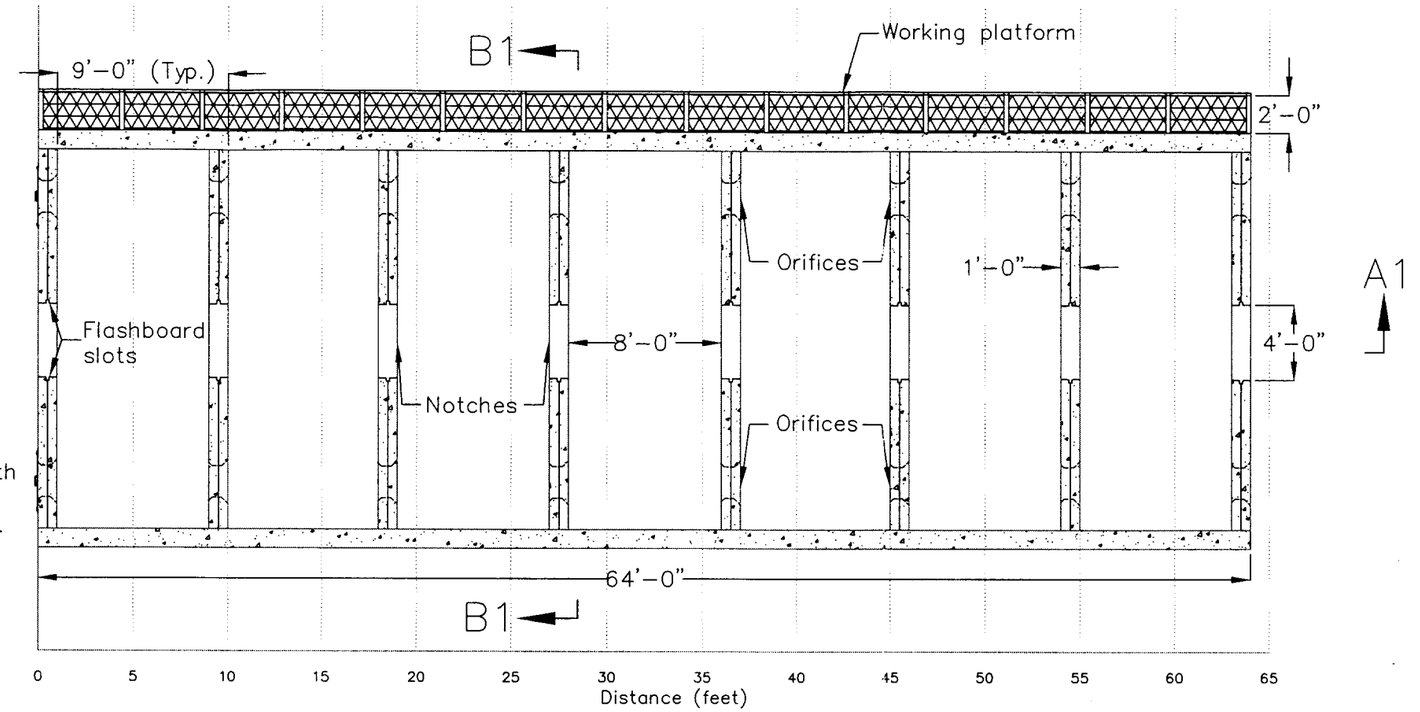
Revision Date: Dec. 9, 1997

Sheet 2 of 14



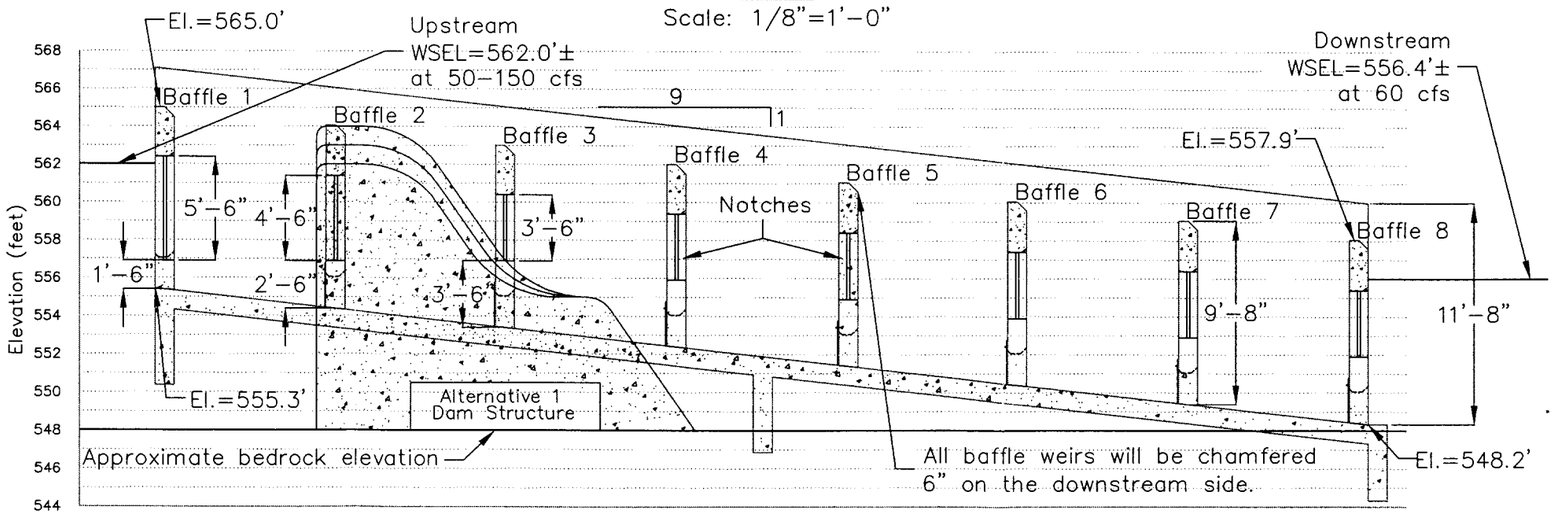
TYPICAL BAFFLE SECTION B1-B1

Scale: 1/8"=1'-0"



Plan

Scale: 1/8"=1'-0"

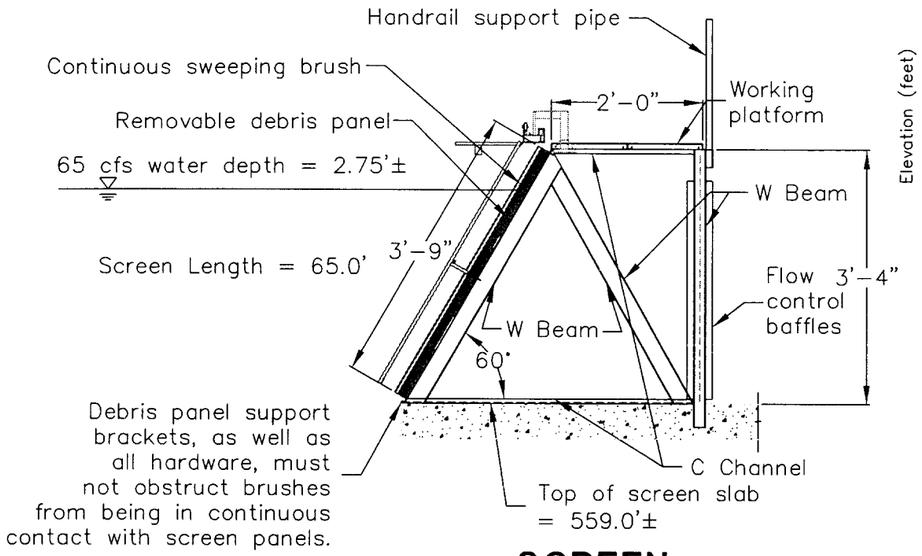


Section A1-A1

Scale: 1/8"=1'-0"

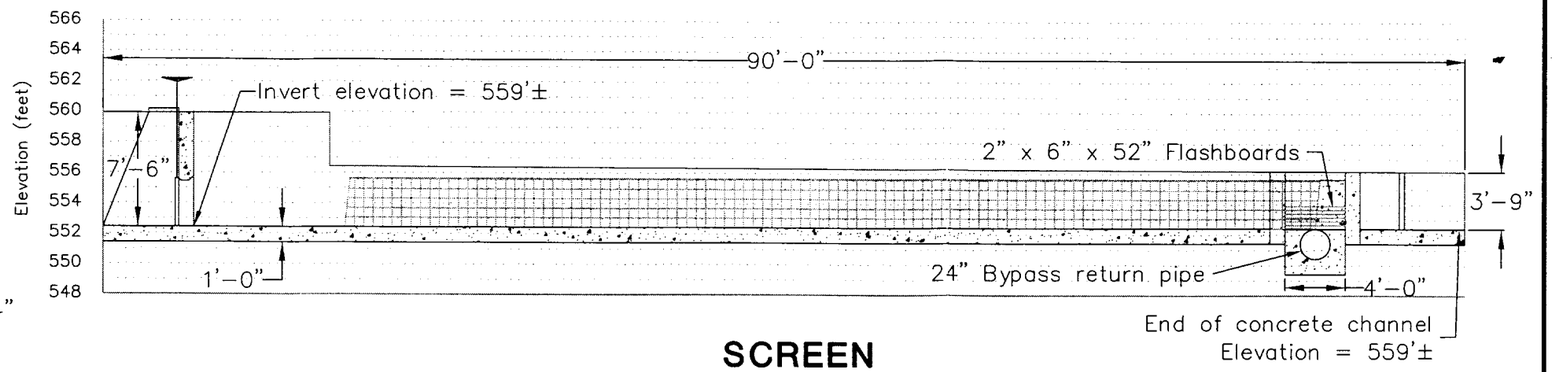
NOTES:
1. All exposed external concrete corners shall be chamfered 3/4".
2. All cutoff wall/footing dimensions are approximate. Actual dimensions shall be determined by the final design Engineer.
3. Also see Preliminary Engineering Technical Report, Final Design Instructions.
4. All baffle orifices will have galvanized orifice flashboard brackets with locking mechanism. Supply 2" x 4" x 27" Douglas flashboards (Typ.).
3. 1' Drop between baffle weirs.

SAELTZER DAM FISH PASSAGE PROJECT Clear Creek near Redding, California	Alternative 1 Fish Ladder Plan, Profile, and Section	STATE OF CALIFORNIA THE RESOURCES AGENCY DEPARTMENT OF WATER RESOURCES NORTHERN DISTRICT	DRAWING : SDSHT3
		Revision Date: December 22, 1997	Sheet 3 of 14



SCREEN SECTION B1-B1

Scale: 1/2"=1'–0"

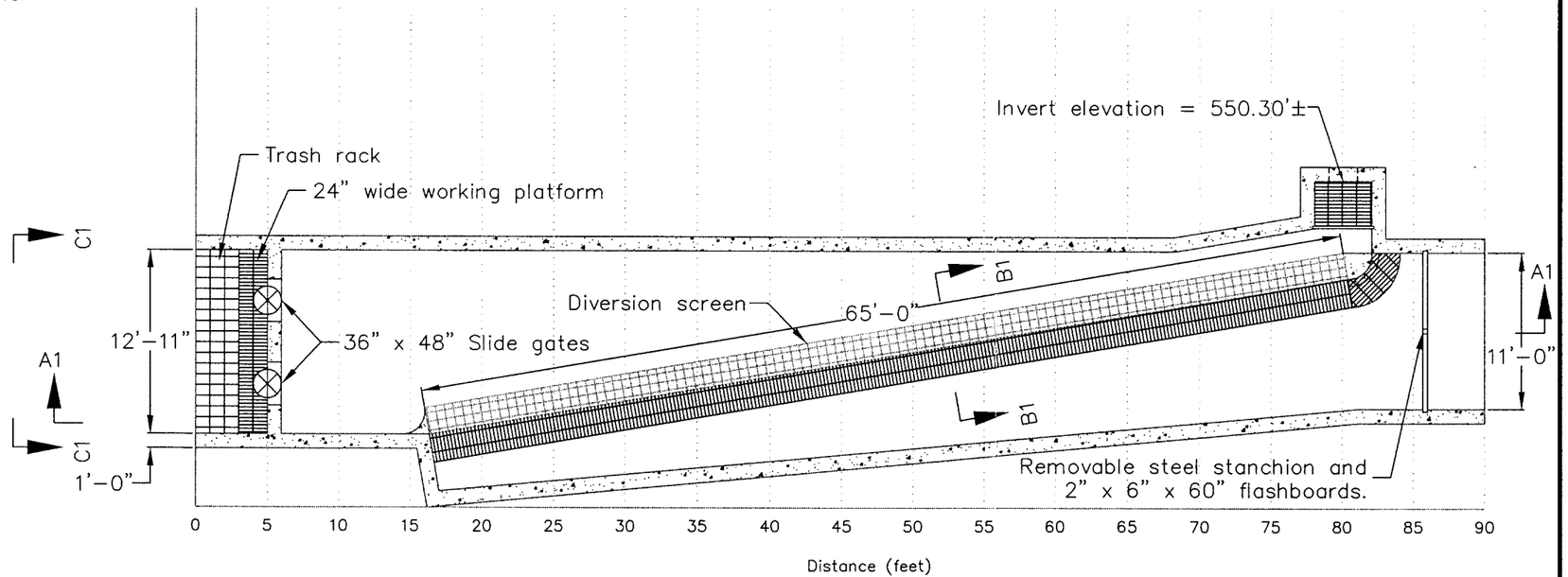


SCREEN SECTION A1-A1

Scale: 1"=10'

SCREEN SECTION C1-C1

Scale: 1"=10'

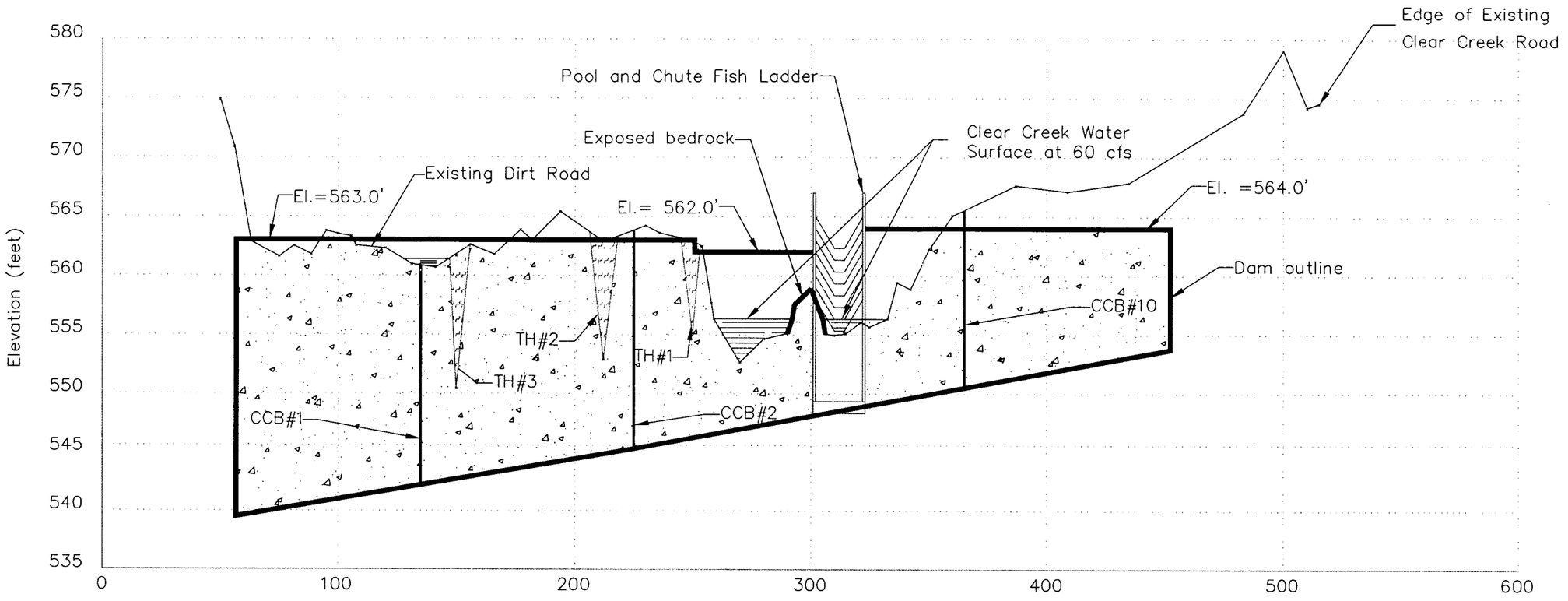


FISH SCREEN PLAN VIEW

Scale: 1"=10'

NOTES:
1. All exposed external concrete corners shall be chamfered 3/4" unless noted otherwise.
2. Also see Preliminary Engineering Technical Report, Final Design Insructions.

SAELTZER DAM FISH PASSAGE PROJECT Clear Creek near Redding, California	Alternative 1 Screen Plan and Profile	STATE OF CALIFORNIA THE RESOURCES AGENCY DEPARTMENT OF WATER RESOURCES NORTHERN DISTRICT Revision Date: December 11, 1997	DRAWING : SDSHT4 Sheet 4 of 14

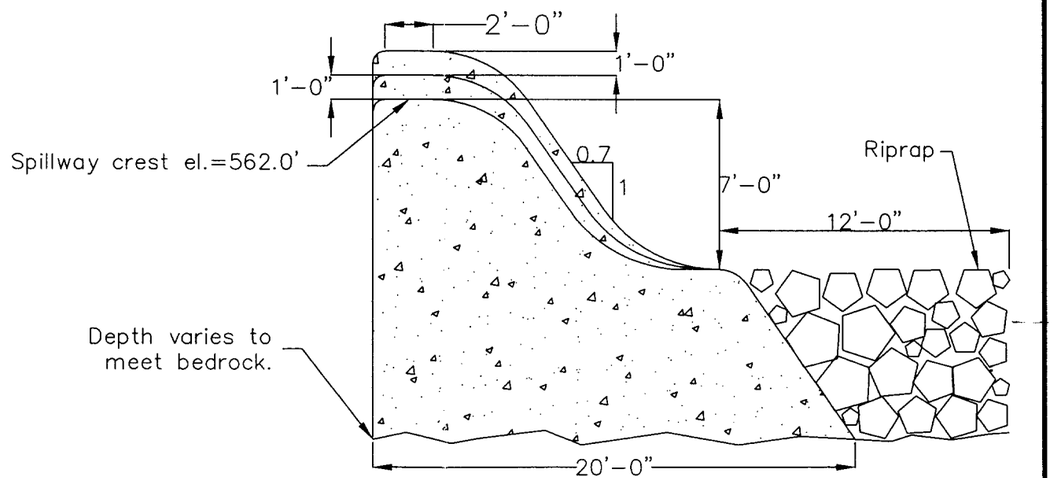


DAM ELEVATION
(LOOKING UPSTREAM)

SCALE:
1"=50' Horizontal
1"=10' Vertical

Notes:
1. Dimensions of new dam are approximate. Actual dimensions shall be determined by the final design Engineer.
2. Dimensions and location of sluice gate to be determined by the final design Engineer. Also see Preliminary Engineering
3. Technical Report, Final Design Instructions.

ELEVATIONS BASED ON
"ENPLAN" POINT #1514,
2-1/2" DIAMETER ALUMINUM
CAP EL=565.96



DAM SECTION (TYP.)

Scale: 1/8"=1'-0"

SAELTZER DAM FISH PASSAGE PROJECT
Clear Creek near Redding, California

Alternative 1 Dam Elevation

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
NORTHERN DISTRICT

Revision Date: December 12, 1997

DRAWING : SDSHT5

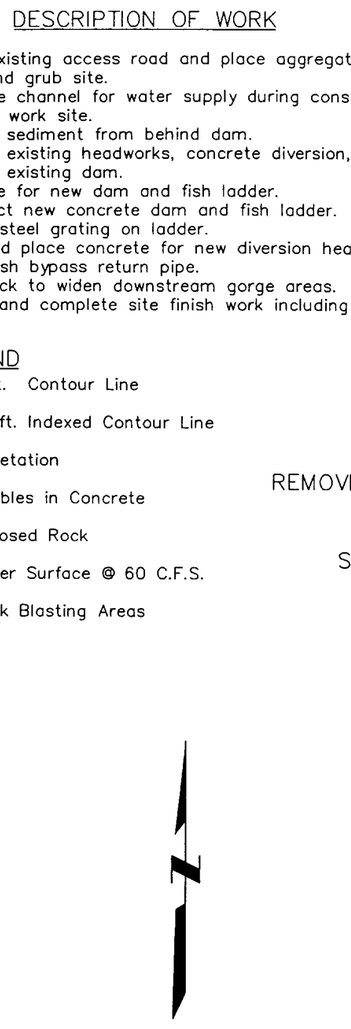
Sheet 5 of 14

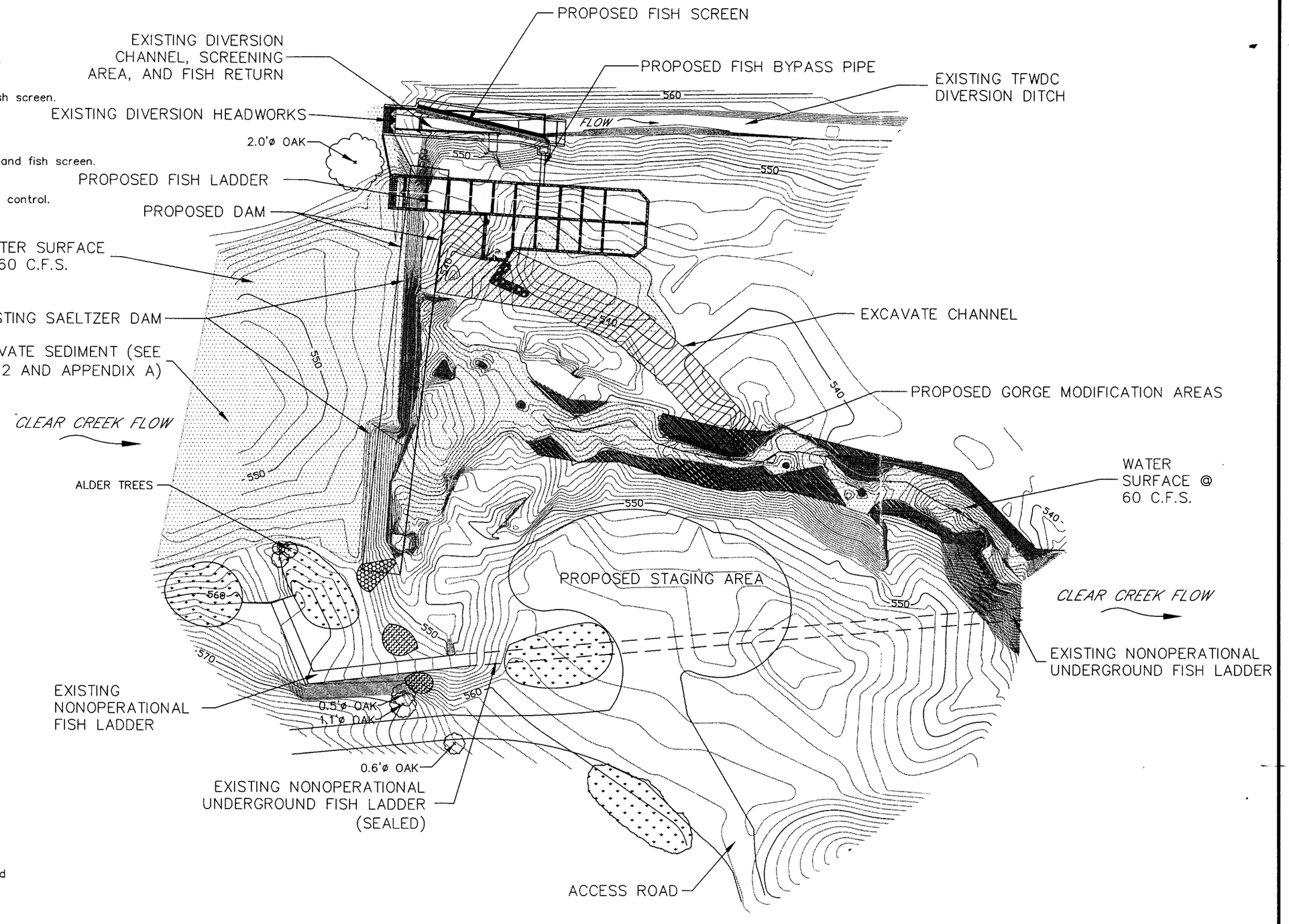
DESCRIPTION OF WORK

1. Grade existing access road and place aggregate base.
2. Clear and grub site.
3. Excavate channel for water supply during construction.
4. Dewater work site.
5. Remove sediment from behind dam.
6. Remove existing headworks, concrete diversion, and fish screen.
7. Remove existing dam.
8. Excavate for new dam and fish ladder.
9. Construct new concrete dam and fish ladder.
10. Install steel grating on ladder.
11. Form and place concrete for new diversion headworks and fish screen.
12. Install fish bypass return pipe.
13. Blast rock to widen downstream gorge areas.
14. Backfill and complete site finish work including erosion control.

LEGEND

- 1 ft. Contour Line
- 540 10 ft. Indexed Contour Line
- Vegetation
- Cobbles in Concrete
- Exposed Rock
- Water Surface @ 60 C.F.S.
- Rock Blasting Areas





Contour map produced by DWR from field survey July and August 1997.
Contour interval is 1 ft.
Vertical Datum is NGVD 1929.

SAELTZER DAM FISH PASSAGE PROJECT

Clear Creek near Redding, California

Alternative 2 Site Plan

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
NORTHERN DISTRICT

Revision Date: December 19, 1997

DRAWING : SDSHT6

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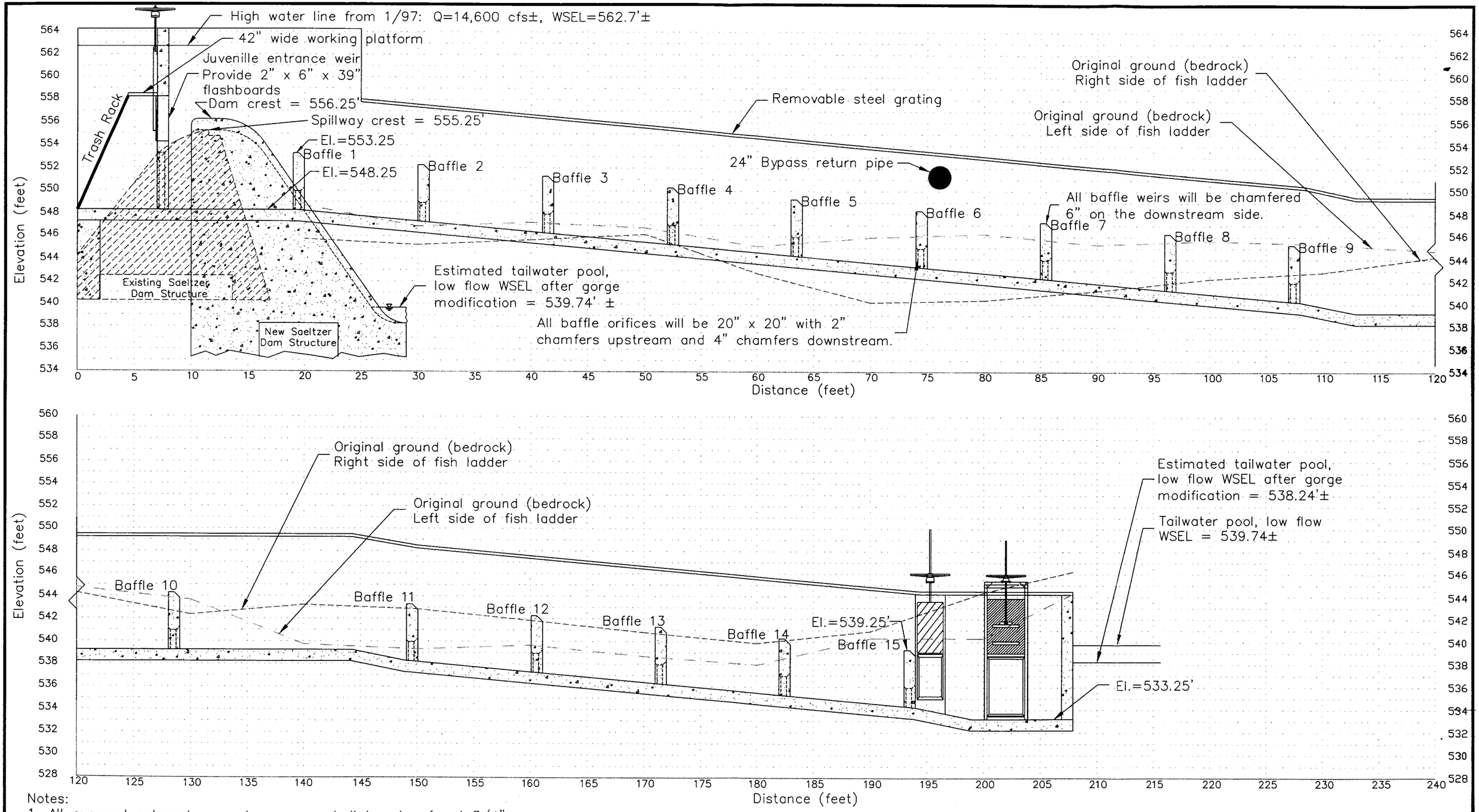


Notes:

1. All exposed external concrete corners shall be chamfered 3/4".
2. Dimensions of new dam is approximate. Actual dimensions shall be determined by the final design Engineer.
3. 1' drop between baffle weirs.

CENTERLINE PROFILE SECTION A2-A2

Scale: 1/8"=1'-0"

SAELTZER DAM FISH PASSAGE PROJECT

Clear Creek near Redding, California

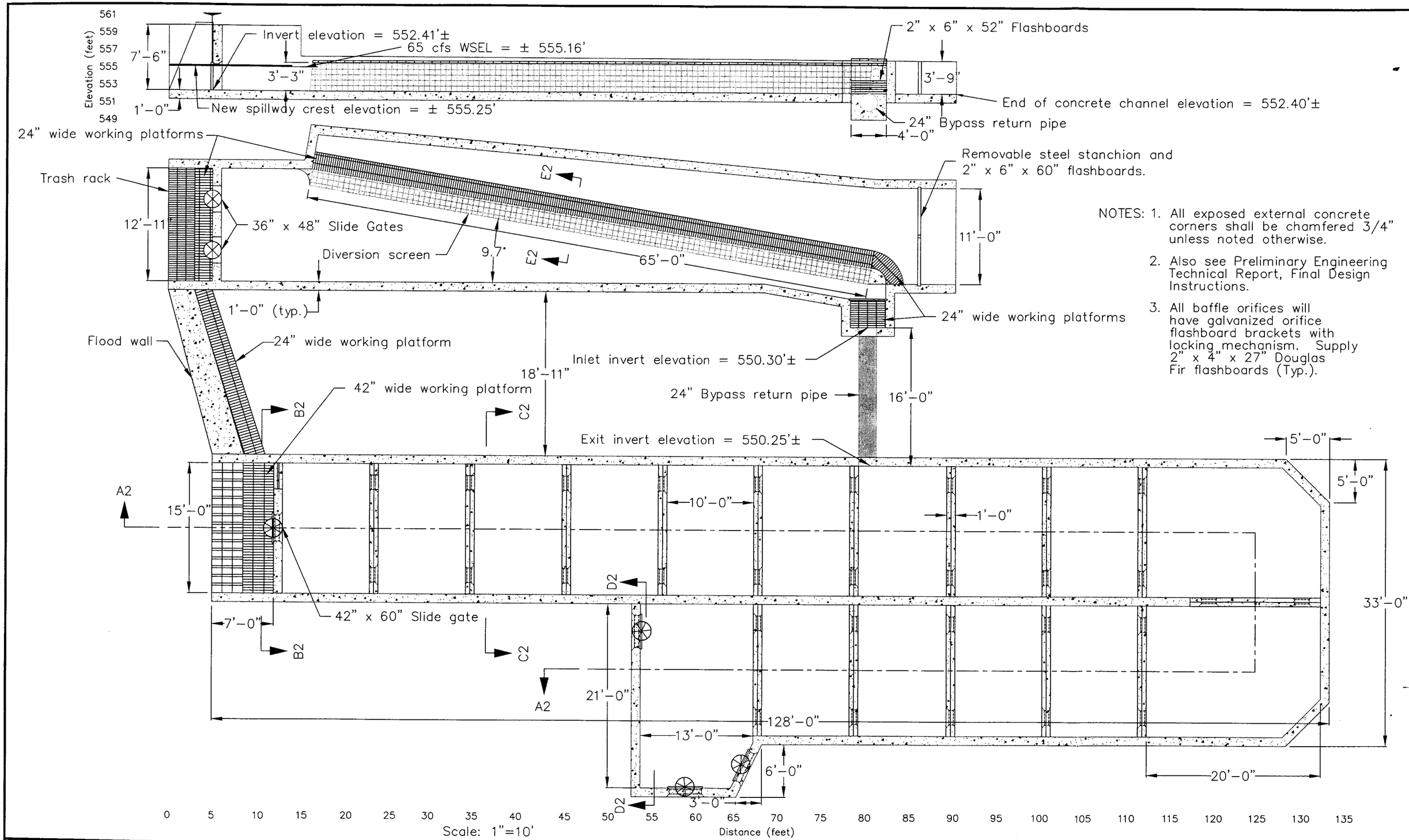
Alternative 2 Fish Ladder Profile

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
NORTHERN DISTRICT

Revision Date: December 22, 1997

DRAWING : SDSHT7

Sheet 7 of 14



NOTES:
1. All exposed external concrete corners shall be chamfered 3/4" unless noted otherwise.
2. Also see Preliminary Engineering Technical Report, Final Design Instructions.
3. All baffle orifices will have galvanized orifice flashboard brackets with locking mechanism. Supply 2" x 4" x 27" Douglas Fir flashboards (Typ.).

SAELTZER DAM FISH PASSAGE PROJECT

Clear Creek near Redding, California

Alternative 2 Ladder Plan and Screen Plan and Profile

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
NORTHERN DISTRICT

Revision Date: December 12, 1997

DRAWING : SDSHT8

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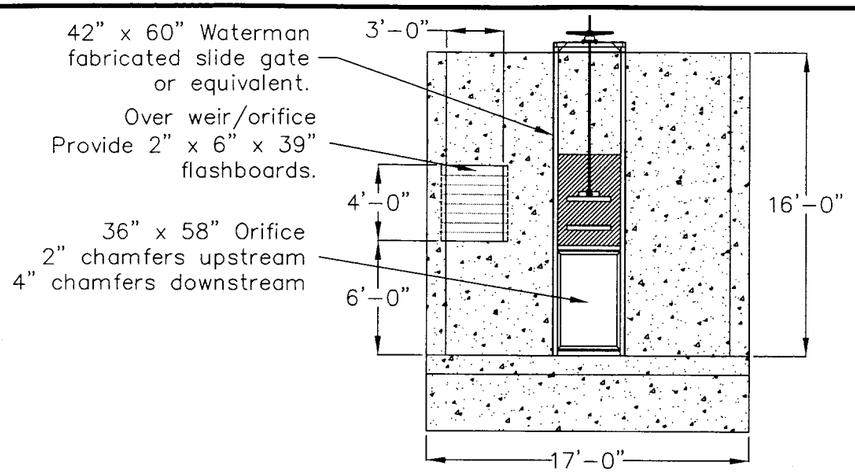
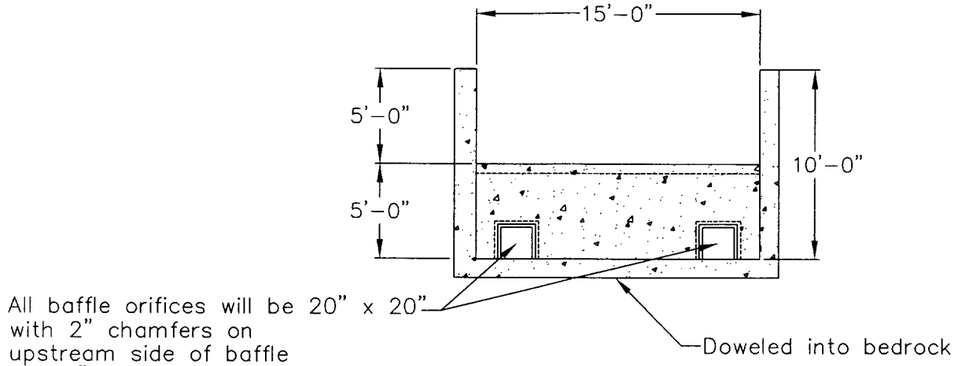


HEADWORKS SECTION B2-B2

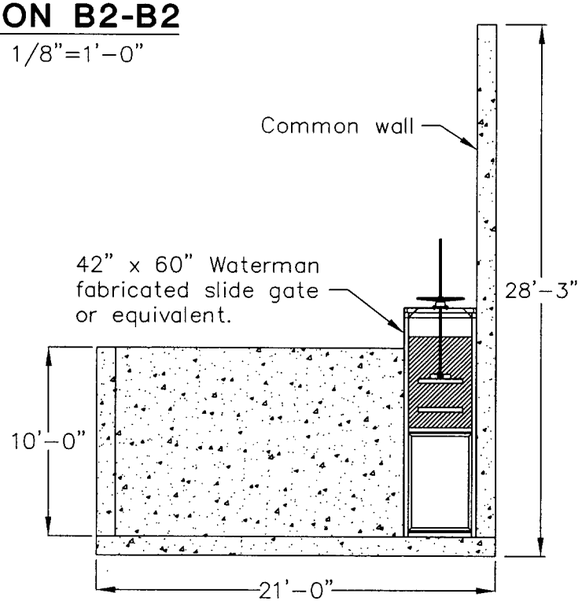
Scale: 1/8"=1'-0"



TYPICAL BAFFLE SECTION C2-C2

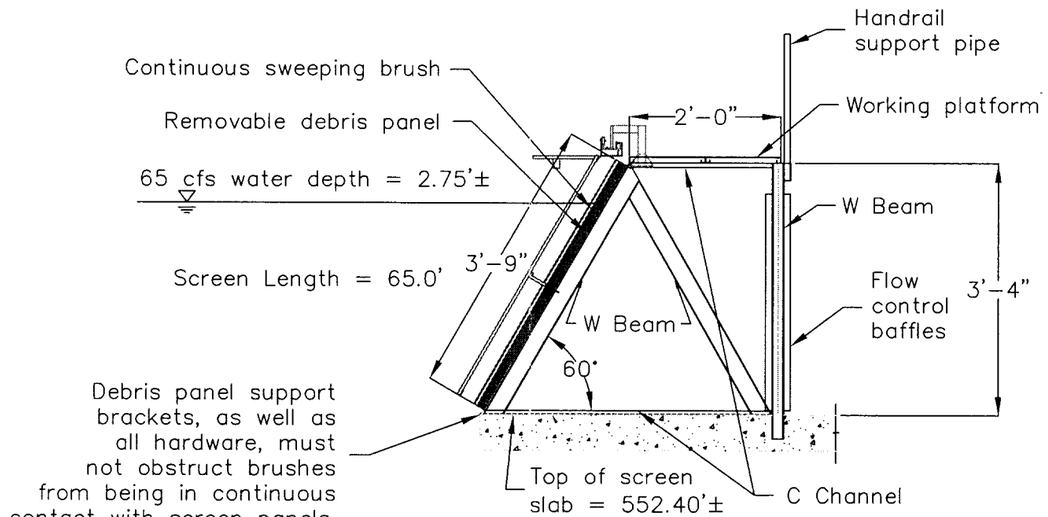
Scale: 1/8"=1'-0"

NOTES:
1. All exposed external concrete corners shall be chamfered 3/4" unless otherwise noted.
2. All cutoff wall/footing dimensions are approximate. Acutal dimensions shall be determined by the final design Engineer.
3. Also see Preliminary Engineering Technical Report, Final Design Instructions.
4. All baffle orifices will have galvanized orifice flashboard brackets with locking mechanism. Supply 2" x 4" x 27" Douglas Fir flashboards (Typ.).



TAILWORKS SECTION D2-D2

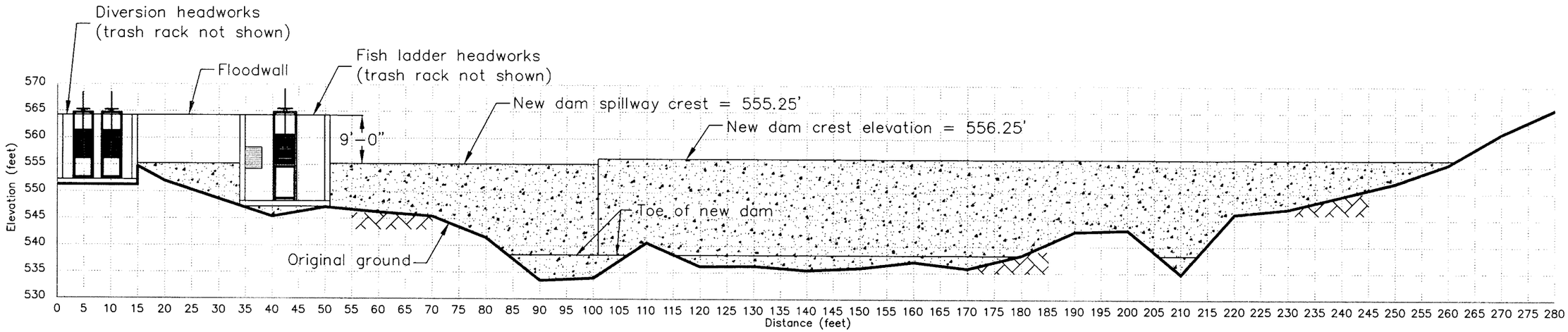
Scale: 1/8"=1'-0"



SCREEN SECTION E2-E2

Scale: 1/2"=1'-0"

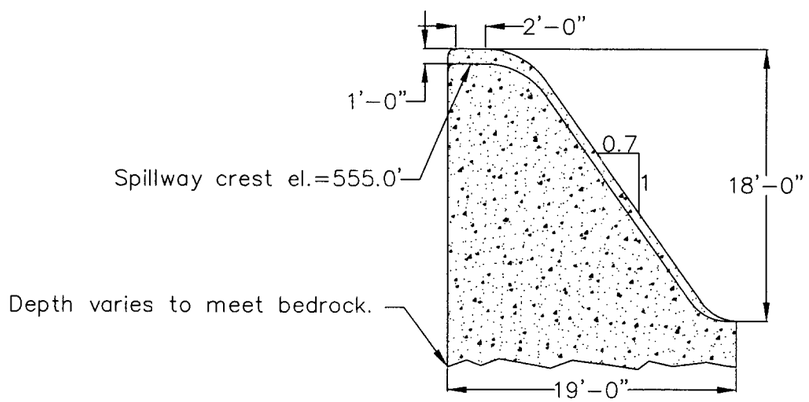
SAELTZER DAM FISH PASSAGE PROJECT Clear Creek near Redding, California	Alternative 2 Ladder and Screen Sections	STATE OF CALIFORNIA THE RESOURCES AGENCY DEPARTMENT OF WATER RESOURCES NORTHERN DISTRICT Revision Date: December 11, 1997	DRAWING : SDSHT9 Sheet 9 of 14



DAM ELEVATION
(Looking Downstream)

Scale: 1"=20'

Notes:
1. Dimensions of new dam are approximate. Actual dimensions shall be determined by the final design Engineer.
2. Dimensions and location of sluice gate to be determined by the final design Engineer.
3. Also see Preliminary Engineering Technical Report, Final Design Instructions.



DAM SECTION (TYP.)

Scale: 1"=10'

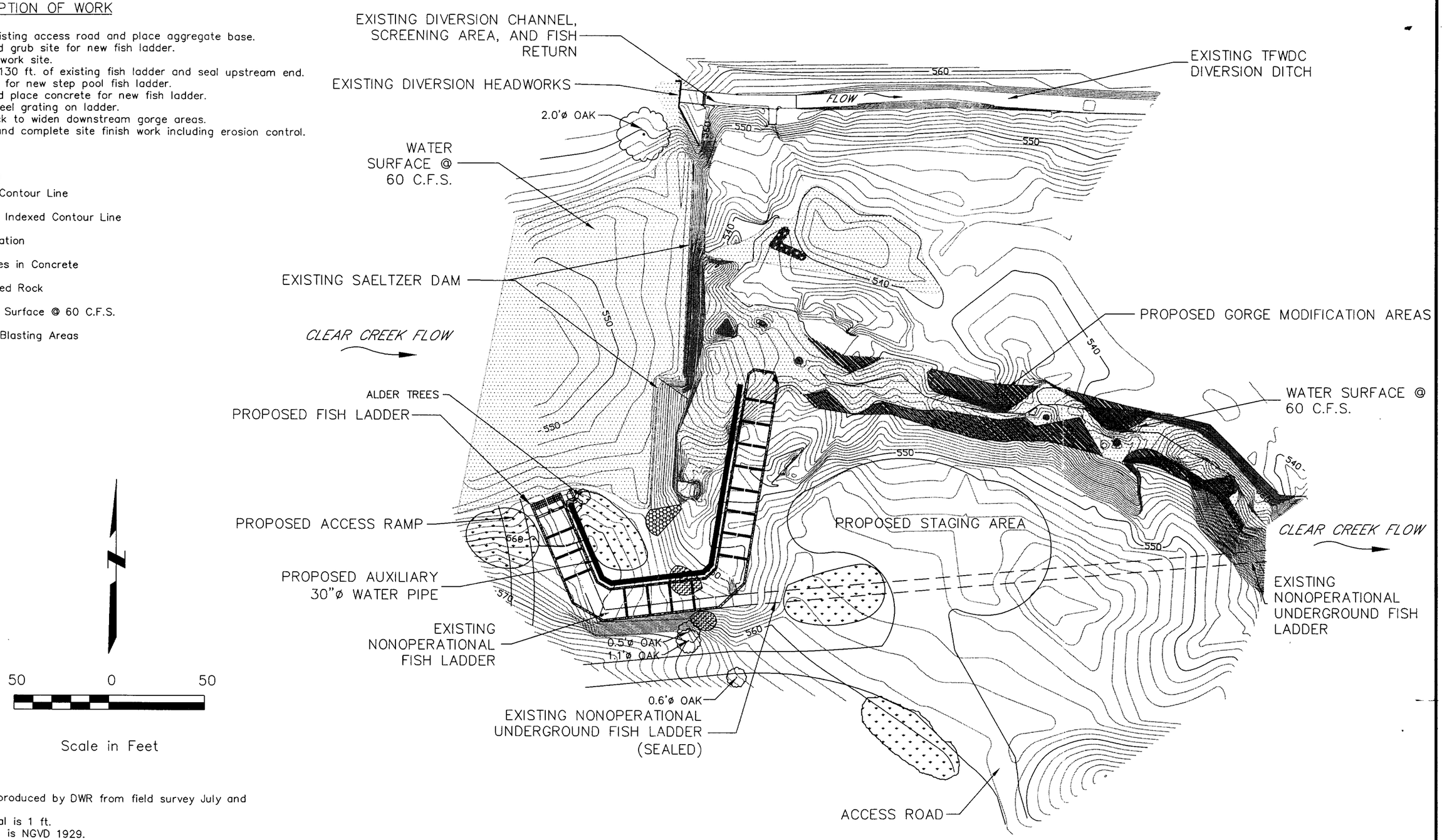
SAELTZER DAM FISH PASSAGE PROJECT Clear Creek near Redding, California	Alternative 2 New Dam and Headworks Elevation	STATE OF CALIFORNIA THE RESOURCES AGENCY DEPARTMENT OF WATER RESOURCES NORTHERN DISTRICT	DRAWING : SDSHT10
		Revision Date: December 19, 1997	Sheet 10 of 14

DESCRIPTION OF WORK

1. Grade existing access road and place aggregate base.
2. Clear and grub site for new fish ladder.
3. Dewater work site.
4. Remove 130 ft. of existing fish ladder and seal upstream end.
5. Excavate for new step pool fish ladder.
6. Form and place concrete for new fish ladder.
7. Install steel grating on ladder.
8. Blast rock to widen downstream gorge areas.
9. Backfill and complete site finish work including erosion control.

LEGEND

- 1 ft. Contour Line
- 540 – 10 ft. Indexed Contour Line
- Vegetation
- Cobbles in Concrete
- Exposed Rock
- Water Surface @ 60 C.F.S.
- Rock Blasting Areas



Contour map produced by DWR from field survey July and August 1997.
Contour interval is 1 ft.
Vertical Datum is NGVD 1929.

SAELTZER DAM FISH PASSAGE PROJECT

Clear Creek near Redding, California

Alternative 3 Site Plan

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
NORTHERN DISTRICT

Revision Date: December 19, 1997

DRAWING : SDSHT11

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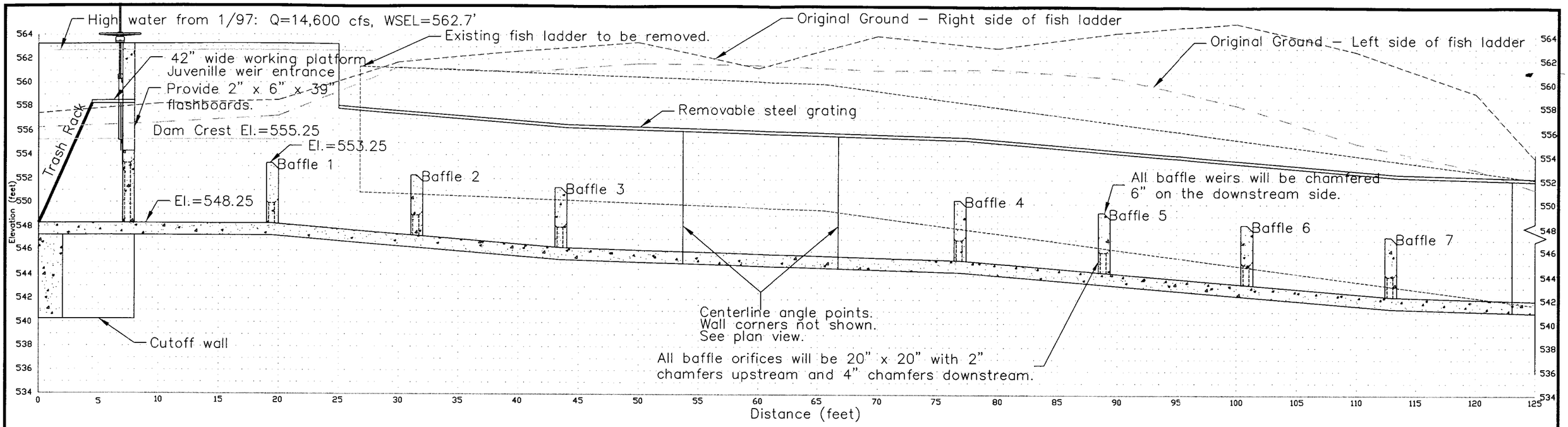

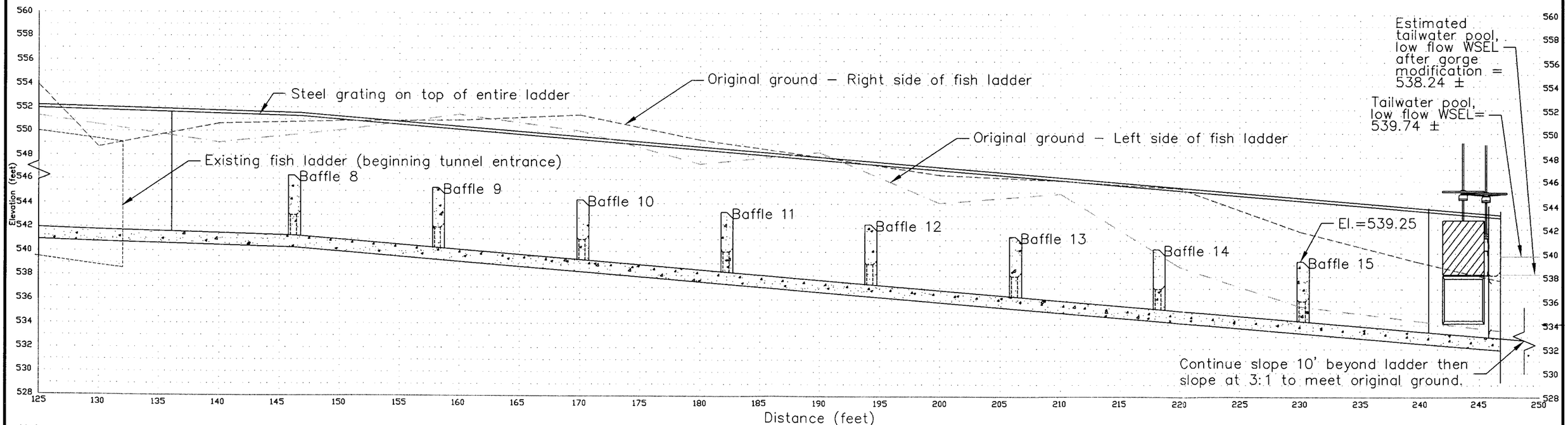

Notes:
1. All exposed external concrete corners shall be chamfered 3/4" unless noted otherwise.
2. All cutoff wall/footing dimensions shall be determined by the final design engineer.
3. 1' drop between baffle weirs.

CENTERLINE PROFILE SECTION A3-A3

Scale: 1/8"=1'-0"

SAELTZER DAM FISH PASSAGE PROJECT
Clear Creek near Redding, California

Alternative 3 Fish Ladder Profile

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
NORTHERN DISTRICT

Revision Date: December 11, 1997

DRAWING : SDSHT12

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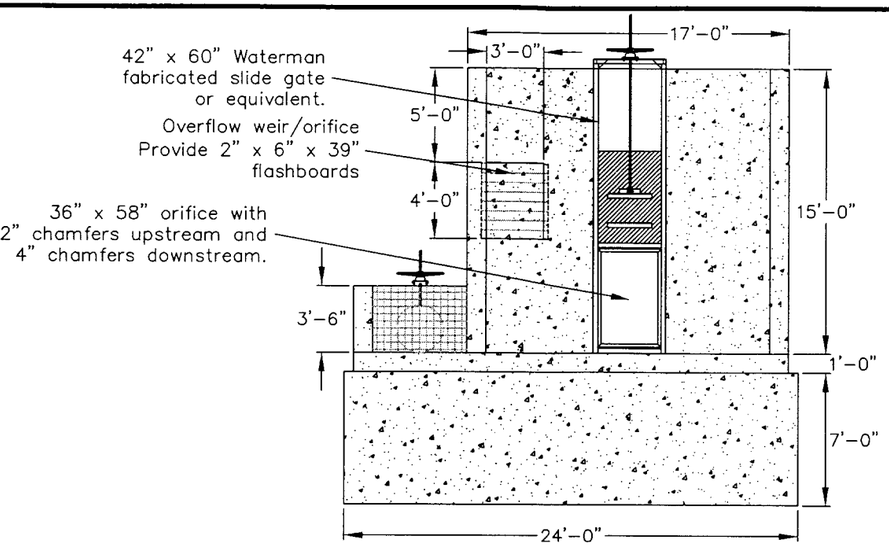
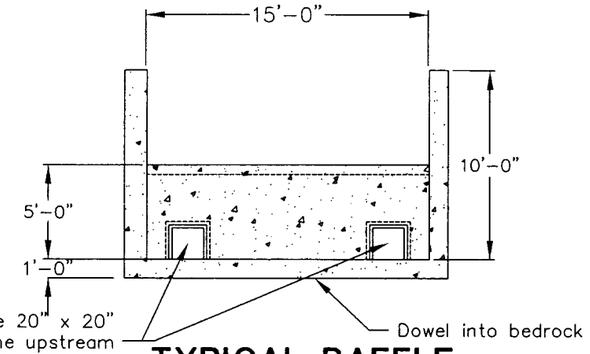


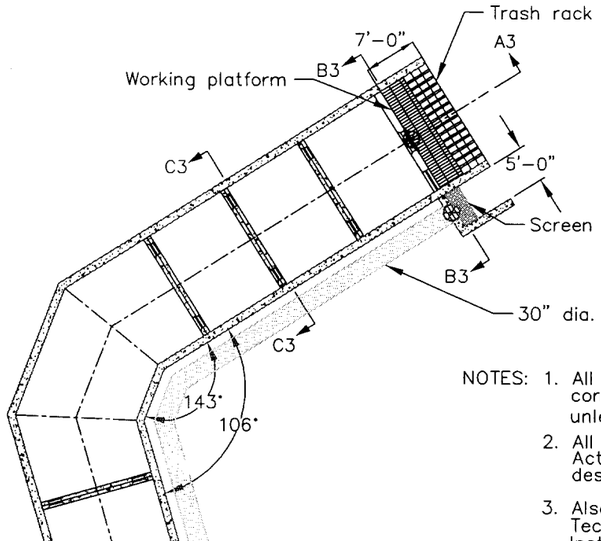
HEADWORKS SECTION B3-B3

Scale: 1/8"=1'-0"

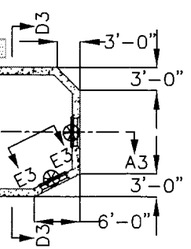


TYPICAL BAFFLE SECTION C3-C3

Scale: 1/8"=1'-0"

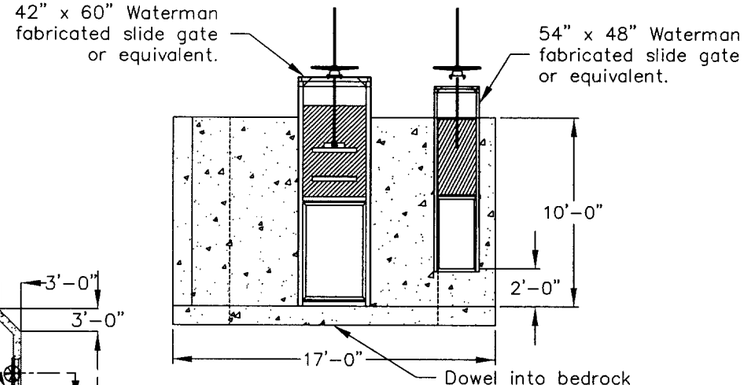


NOTES:
1. All exposed external concrete corners shall be chamfered 3/4" unless noted otherwise.
2. All cutoff wall/footing dimensions are approximate. Actual dimensions shall be determined by the final design Engineer.
3. Also see Preliminary Engineering Technical Report, Final Design Instructions.
4. All baffle orifices will have galvanized orifice flashboard brackets with locking mechanism. Supply 2" x 4" x 27" Douglas Fir flashboards (Typ.).



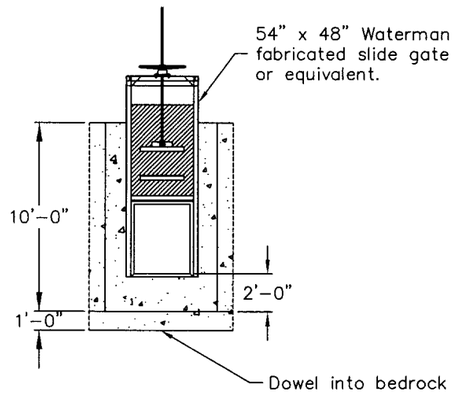
FISH LADDER PLAN VIEW

Scale: 1"=20'



TAILWORKS SECTION D3-D3

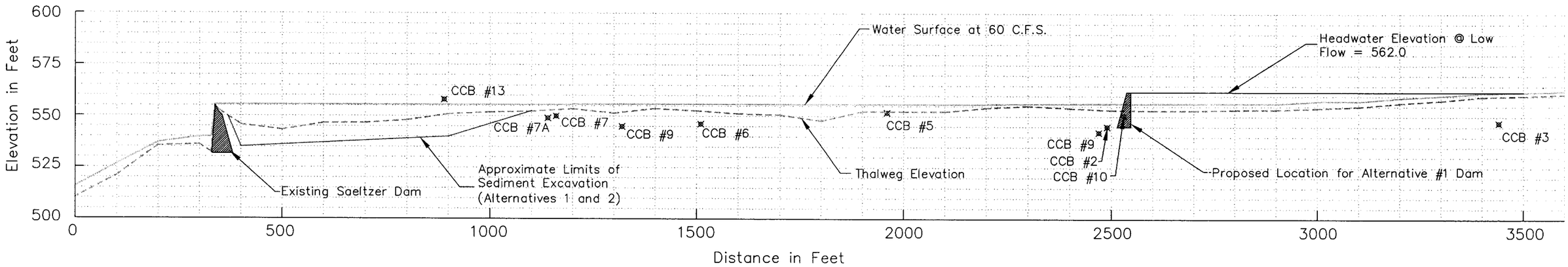
Scale: 1/8"=1'-0"



TAILWORKS SECTION E3-E3

Scale: 1/8"=1'-0"

SAELTZER DAM FISH PASSAGE PROJECT Clear Creek near Redding, California	Alternative 3 Ladder Plan and Sections	STATE OF CALIFORNIA THE RESOURCES AGENCY DEPARTMENT OF WATER RESOURCES NORTHERN DISTRICT Revision Date: December 11, 1997
		DRAWING : SHSHT13 Sheet 13 of 14



THALWEG AND WATER SURFACE PROFILE

NOTES

1. Stationing Begins at Downstream End of Gorge Modification Area.
2. Field Surveyed July & August, 1997.
3. See Appendices F and H for Bore Hole Locations and Elevations.

LEGEND

- Water Surface at 60 C.F.S.
- Thalweg Elevation
- CCB Points Indicate Top of Bedrock Elevation at Bore Hole Location. Bore Hole locations are offset from Centerline Profile. Refer to Appendices F and H.

SAELTZER DAM FISH PASSAGE PROJECT Clear Creek near Redding, California	Clear Creek Profile	STATE OF CALIFORNIA THE RESOURCES AGENCY DEPARTMENT OF WATER RESOURCES NORTHERN DISTRICT	DRAWING : SDSHT14
		Revision Date: December 22, 1997	Sheet 14 of 14

Appendix A

Environmental Documentation

and

Sediment Removal Project Biological Assessment

and

Memo: "Status of 1993-1994 Clear Creek Fishery Habitat Restoration Project Permits"

August 29,1997

Bill Mendenhall

Dave Bogener

Clear Creek Fish Passage Improvement Project

During August 1997, Kevin Dossey provided a field tour of the proposed Clear Creek Fish Passage Improvement Project for Joyce Lacey and me. At that time Mr. Dossey outlined the three alternatives currently being considered (identified as alternative 4, 7, and 10 in the July 14, 1997 memo).

Based on the information provided in the field tours, Joyce and I have prepared a list of environmental "permits" which may be required for the various alternatives (Table 1). Under alternatives 7 and 10 several CEQA categorical exemptions may be applicable including 15301 (d) restoration and rehabilitation of deteriorated or damaged structures, 15301 (h) maintenance of fish ladders, and 15302 (b) replacement or reconstruction of a commercial structure. The use of categorical exemptions are not allowed if significant environmental effects related to the project are identified. No applicable exemptions were identified for alternative 4.

Based on the habitat information collected during the tours, we consulted the Natural Diversity Database and the California Wildlife/Habitat Relationships Database to develop a list of State and federally "listed" plant and animal species which could occur in the project area (Table 2). Wildlife species designated as California Species of Special Concern and plant species on the California Native Plant Society list are included in Table 2. Because of the two year project time frame it appears prudent to examine potential project impacts on these species as well as formally "listed" species.

On August 28, 1997, Joyce, Kevin, and I attempted to identify all of the potential environmental issues (both short-term and long-term) associated with aspects of each alternative (Table 3). Most of the issues identified on the list appear relatively easy to deal with, either through avoidance of use of best management practices.

The information in the three tables represents a rough first cut based on our current knowledge of what the different alternatives may involve. Please distribute these tables to the parties involved in the project and solicit their comments, concerns and changes. All three tables may change as additional project related details are identified. If you have any questions concerning any of this information, please contact me at (916) 529-7329.

CC: Paul Ward
Joyce Lacey
Kevin Dossey

Table 1. Environmental Permits Potentially Required for the Proposed Clear Creek Fish Passage Improvement Project

Federal

- USACE 404 Permit-Nationwide Permits for alternatives 7&10
  - Nationwide Permit 4-Fish and wildlife harvesting, enhancement, and attraction devices
  - Nationwide Permit 33-Temporary construction, access and dewatering
  - Full 404 permit (delineation and mitigation) for alternative 4
- Federal Endangered Species Act Compliance (see Table 5) (include BLM sensitive species?)
  - If federally listed species present, may need federal nexus for Section 7 ESA
- Nepa Compliance (if federal funds or approvals are involved)
- Surface Mining Reclamation Act Compliance (depends on how dredged materials are disposed)

State

- RWQCB 401 Water Quality Certification (all alternatives)
- RWQCB Stormwater Permit (if ground disturbance involves more than 5 acres)
- DFG 1600 Agreement (all alternatives) F&G dredge permit Section 5653 DFG Code?
- CEQA Compliance (Categorical exemptions may apply for Alternatives 7 and 10)
- State Endangered Species Act Compliance (see Table 5)
- DWR Dam Safety Compliance? (Depends on height of dam(s) and storage potential)
- State Lands Commission notification

Local

- Shasta County grading ordinance
- Shasta County administration of SMRA

Table 2. State and federally "listed" species that may occur in the Clear Creek Fish Passage Improvement project area and their current status

Common Name	Scientific Name	Status/Listing
golden eagle	*Aquila chrysaetos*	CSSC
southern bald eagle	*Haliaeetus leucocephalus*	FT, CE
osprey	*Pandion haliaeetus*	CSSC
Cooper's hawk	*Accipiter cooperi*	CSSC
sharp-shinned hawk	*Accipiter striatus*	CSSC
ferruginous hawk	*Buteo regalis*	CSSC
northern harrier	*Circus cyaneus*	CSSC
double-crested cormorant	*Phalacrocorax auritus*	CSSC
California gull	*Larus californicus*	CSSC
bank swallow	*Riparia riparia*	CT
long-eared owl	*Asio otus*	CSSC
willow flycatcher	*Empidonax traillii*	CE
purple martin	*Progne subis*	CSSC
yellow warbler	*Dendroica petechia*	CSSC
yellow-breasted chat	*Icteria virens*	CSSC
steelhead	*Oncorhynchus mykiss gairdneri*	F CAT 1
chinook salmon (spring-run)	*Oncorhynchus tshawytscha*	C CAND
foothill yellow-legged frog	*Rana cascadae*	CSSC, F CAT 2
red-legged frog	*Rana aurora*	CSSC, FE
southwestern pond turtle	*Clemmys marmorata*	CSSC, F CAT 2
Townsend's western big-eared bat	*Plecotus townsendii*	CSSC
pallid bat	*Antrozous pallidus*	CSSC
valley elderberry longhorned beetle	*Desmocerus californicus dimorphus*	FT
silky cryptantha	*Cryptantha crinita*	F CAT 2, CNPS 1b
Red Bluff dwarf rush	*Juncus leiospermus leispermus*	F3c, CNPS 1b
Howell's alkali grass	*Puccinellia howelli*	F CAT 1, CNPS 1b

FE- federal endangered
FT-federal threatened
CE- California endangered
CT- California threatened
CSSC- California species of special concern
C CAND-California candidate
F CAT 1 Proposed federal
F CAT 2 Proposed federal
CNPS 1b- California Native Plant Society List (Rare or endangered in California and elsewhere)

Table 3. Potential environmental issues related to aspects of the three alternatives under the Clear Creek Fish Passage Improvement Project

Sediment Removal

Short Term

turbidity, suspended solids
toxics in sediments
increased nutrient concentrations
hazardous material spills (diesel, oil, gas)
poorer WQ to water users
aesthetic impacts (visible from Clear Creek road)

Impacts to riparian habitat

mechanical damage
dust
noise
changes in water table, flow rates and their effects
take of aquatic and riparian species and habitat
hazardous material spills (diesel, oil, gas)
decreased recreational use

Long term

mechanical damage to dam (project engineer says not likely)
long term maintenance

Fish Ladder

Short Term

turbidity, suspended solids
hazardous material spills (diesel, oil, gas)
mechanical damage to dam (project engineer says not likely)
take of aquatic and riparian species and habitat

Long term

improved fish passage
increased maintenance
mechanical damage to dam (project engineer says not likely)
increased safety hazard and liability?
dam historical value

Fish Screen

Short Term

decreased short term water delivery to users (seems avoidable)
hazardous material spills (diesel, oil, gas)
turbidity
take of aquatic and riparian species and habitat

Long term

increased maintenance-permanent habitat loss
decreased fish loss and mortality
increased safety hazard and liability

Table 3. (continued)

New Upstream Dam

Short Term

- loss of wetland habitat (mitigate under 404 permit)
- take of aquatic and riparian species and habitat
- dam safety jurisdiction?
- turbidity, suspended solids
- dust
- noise
- hazardous material spills (diesel, oil, gas)
- aesthetic impacts

Long term

- dam safety jurisdiction?
- increased water temp?
- improved fish passage
- increased maintenance?
- increased safety hazard and liability
- habitat modification (positive and negative tradeoffs)
- changes in water table effects? In flow rates?
- short-term changes in gravel recruitment rates to lower Clear Creek

New Conveyance System

Short Term

- loss of upland and wetland habitat and effects on wildlife
- archeological concerns
- soil loss, erosion
- barrier to movement wildlife movement (short-term)
- turbidity, suspended solids
- dust
- noise
- hazardous material spills (diesel, oil, gas)
- aesthetic impacts

Long term

- increased maintenance? vandalism?
- loss of upland and wetland habitat and effects on wildlife

State of California
The Resources Agency
Department of Water Resources

BIOLOGICAL ASSESSMENT
CALIFORNIA ENDANGERED SPECIES ACT
CLEAR CREEK FISHERY HABITAT RESTORATION PROJECT

Prepared by

James Starr
Bay-Delta and Special Water
Projects Division
California Department of Fish and Game

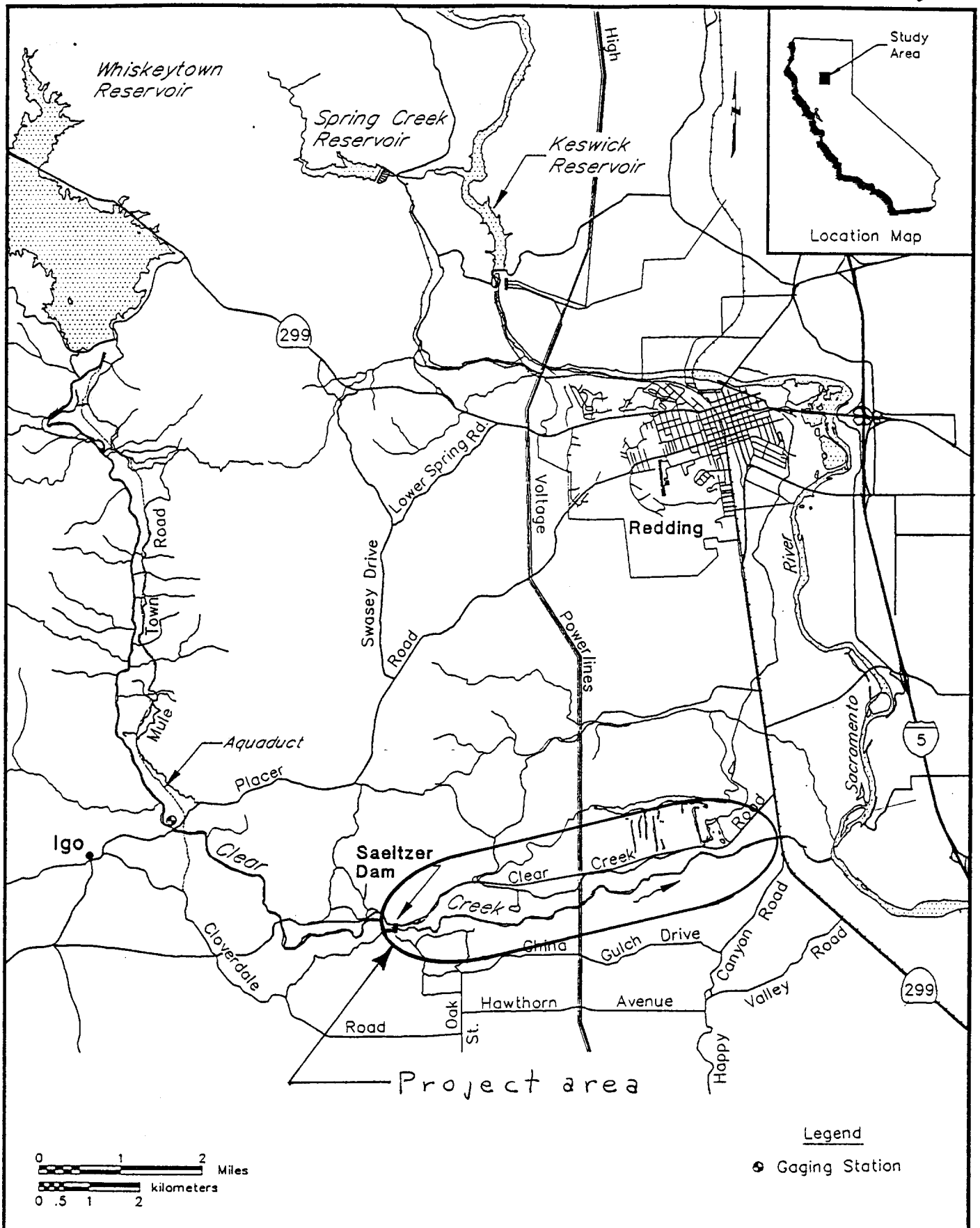
SUMMARY

Pursuant to Section 2090 of the California Endangered Species Act (CESA), the Department Water Resources (DWR) has prepared a Biological Assessment to determine if implementation of the Clear Creek Fishery Habitat Restoration Project (CCFHRP) is likely to jeopardize the continued existence of any state-listed endangered or threatened species or result in the destruction or adverse modification of habitat essential to the continued existence of those species. DFG personnel with expertise on various affected species have been consulted. This consultation covers all State (S) and federally (F) designated rare (R), threatened (T), endangered (E) species, and species that the DFG feel are of special concern (SPC), which could be adversely affected by construction or management activities covered by the proposed CCSRP. Federal candidates (FC) for listing and U. S. Forest Service sensitive species (FSS) are also discussed.

The assessment consultation considered the potential impacts that implementation of the CCFHRP could have on those listed and candidate species which occur in the vicinity of the proposed project (Figure 1). The focus of this assessment, however, is on those species in Table 1 which were determined to be potentially affected by the proposed CCFHRP. Other species will not be considered further in this opinion.

The DFG will, after receipt of this assessment, determine whether implementation of the project, with the modifications and project conditions identified in this assessment will jeopardize the continued existence of any state-listed species or result in the loss of habitat essential to the continued existence of any listed species.

Figure 1



Clear Creek and Vicinity

Table 1. List of Species that may occur in the Project Area and their Current Status

Common Name	Scientific Name	Status/Listing
southern bald eagle	*Haliaeetus leucocephalus*	FE, CE
osprey	*Pandion haliaeetus*	SPC
bank swallow	*Riparia riparia*	CT
long-eared owl	*Asio otus*	SPC
willow flycatcher	*Empidonax traillii*	CE,F CAT 1
yellow warbler	*Dendroica petechia*	SPC
yellow-breasted chat	*Icteria virens*	SPC
chinook salmon spring-run	*Oncorhynchus tshawytscha*	SPC
red-legged frog	*Rana aurora*	SPC,F CAT 2
southwestern pond turtle	*Clemmys marmorata*	SPC,F CAT 2
silky cryptantha	*Cryptantha crinita*	C2, CNPS 1b
Red Bluff dwarf rush	*Juncus leiospermus leispermus*	C3c, CNPS 1b
diamorphic snapdragon	*Antirrhinum subcordatum*	C3c, CNPS 1b

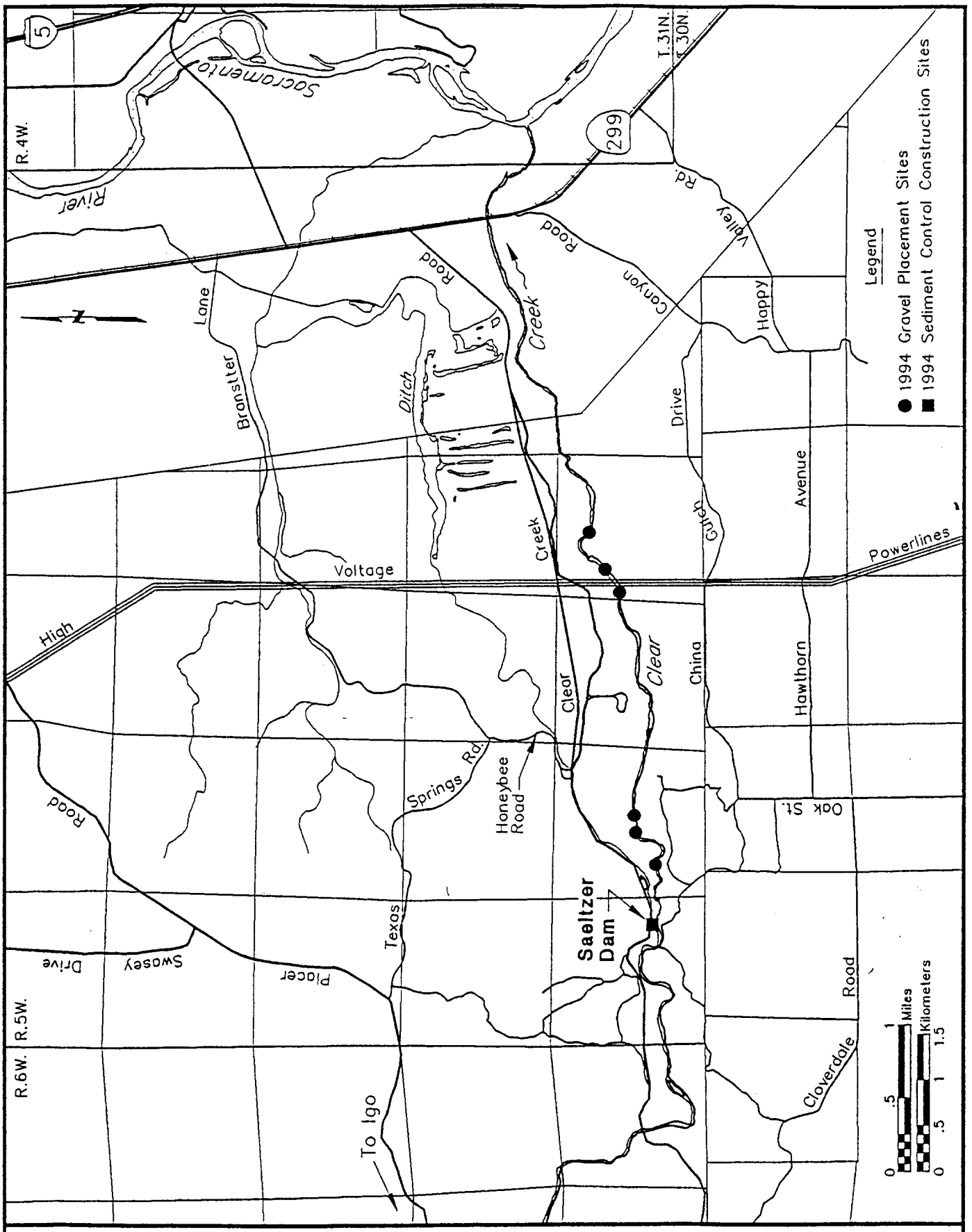
FE - federal endangered
F CAT 1 Proposed federal
F CAT 2 Proposed federal
C2 - Federal candidate species
C3c- Considered as a federal candidate species at one time but found to be too widespread and/or not threatened
CE - California endangered
CT - California threatened
SPC- California species of special concern
CNPS 1b California Native Plant Society - Plants rare and endangered in California and elsewhere

Project Description

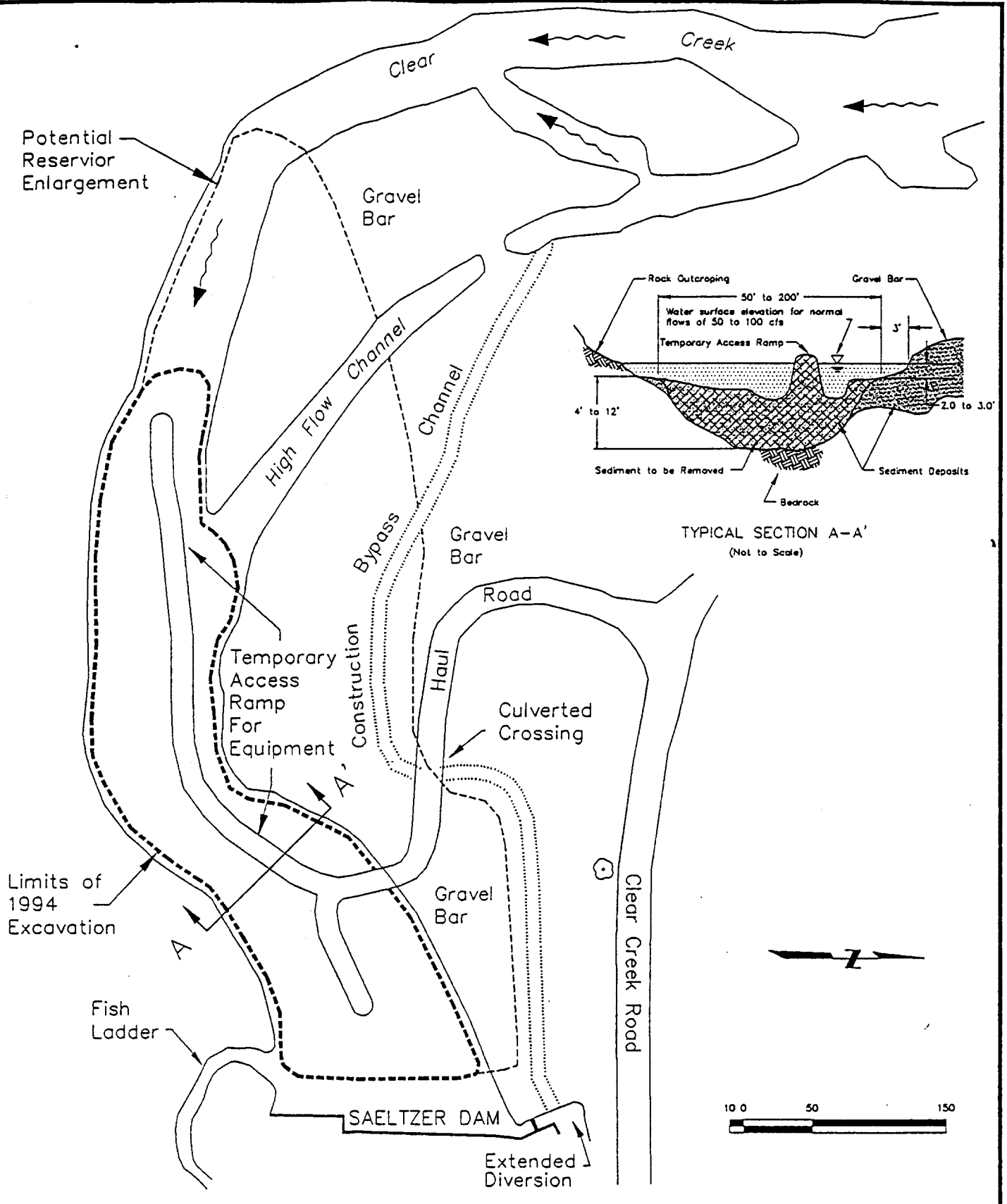
The Clear Creek restoration project will remove sediment above Saeltzer Dam and improve spawning habitat below the dam (Figure 2).

Removal of sediment will be accomplished by dredging with a hydraulic excavator (backhoe) and will need to be repeated periodically. This dredged material will be evaluated for its potential as a source for spawning gravel material. If found unsuitable, the material may be used for fill in upland areas or processed for commercial use (Figure 3).

A bypass channel will be constructed on the adjacent gravel bar. This channel would divert flows around the dredging work to reduce downstream turbidity. Its alignment would be chosen to minimize impacts to existing vegetation.



1994 Clear Creek Restoration Project Sites



Saeltzer Dam Excavation Site

Dredging activities may result in the temporary loss of some streamside vegetation (1/8 to 1/4 acre) at equipment access ramps. The work will be designed to keep these losses to a minimum by constructing single paths 15 to 30 feet wide through existing riparian corridors in areas where vegetation can not be avoided. Disturbed areas will be revegetated with appropriate native grass species.

Presently, there is scattered aquatic vegetation in Saeltzer reservoir. Dredging will remove these plants in the areas excavated. Pool design will retain shallow benches of existing bottom material at the edges of the reservoir for safety in entering and exiting the pool. Aquatic vegetation will remain on these benches. As the pool fills with sediment, changes in depths will favor re-establishment of some of the vegetation, until the reservoir again requires dredging. The interval between dredging projects is unknown because of unpredictable runoff patterns.

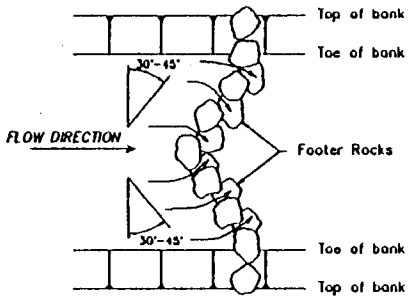
Spawning habitat restoration will involve the placement of 5,000-10,000 cubic yards of cleaned, graded spawning-sized gravel at locations below Saeltzer Dam. Work will include improving existing gravel roads, and constructing short sections of new roads with truck turn around areas for equipment access to Clear Creek. This will result in an impact to approximately 3 to 5 acres of vegetation (mostly grass, with alders and willows near the creek's edge). Access routes will be chosen to minimize disturbing existing vegetation. Depending on future flood flows, spawning areas will require periodic replenishment with new spawning gravel.

Mechanical (tractor) ripping may be used to loosen compacted gravel beds. Loosening gravels will allow fine sediment to flush out during high flows and benthic organisms to establish under the rocks, and improve spawning habitat.

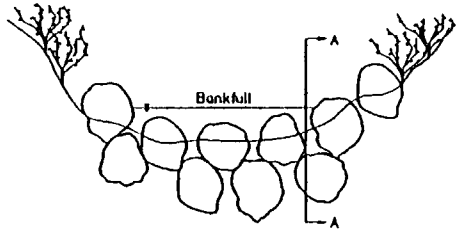
At some restoration sites, channel and bank changes will be needed to correct flow depths over spawning riffles. This may involve placement of boulder clusters to direct flows or removal of sediment deposits from within the stream channel (Figure 4).

Where there has been extensive loss of gravels from mining and floods, instream structures will be used to re-establish the channel into a low flow meander configuration. These will consist of log, rootwad, boulder and rock reventments on the outside of meander bends, gravel point bars on the inside bends, and/or boulder weirs and clusters to create step-pool sequences (Figure 5).

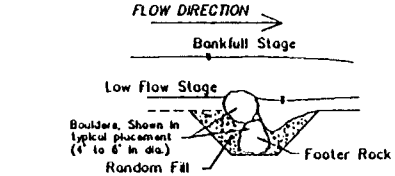
An existing sandy bank located about 3/4 mile down stream from Saeltzer Reservoir will be stabilized by vegetation planting and other means to prevent it from eroding and damaging restored



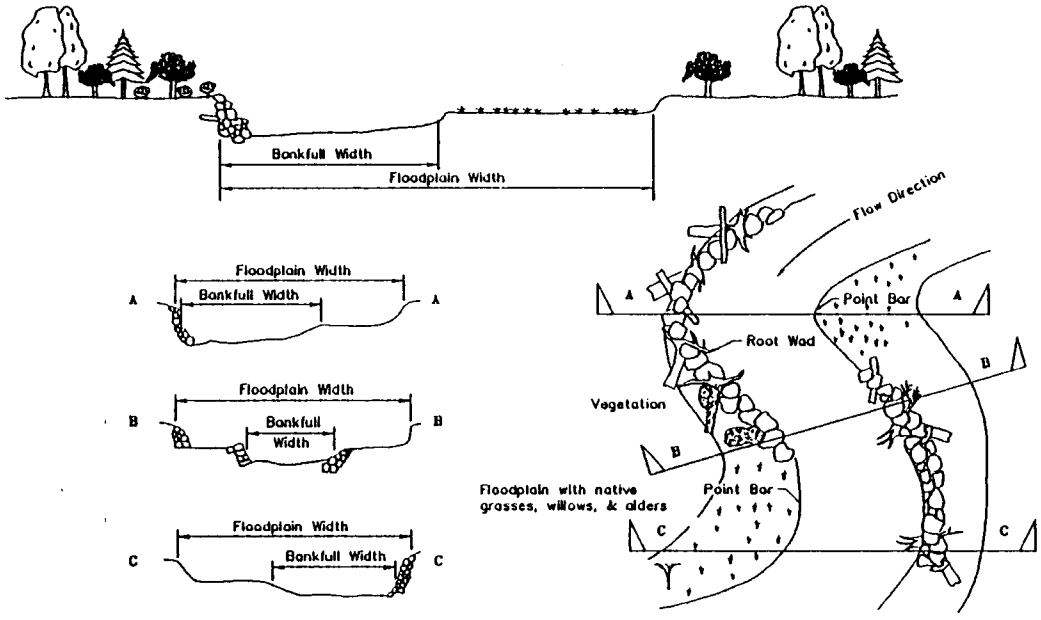
PLAN VIEW FOR
VORTEX ROCK STRUCTURE



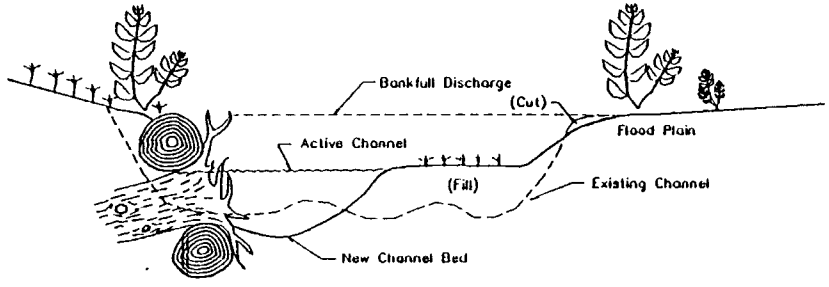
CROSS-SECTIONAL VIEW FOR
VORTEX ROCK STRUCTURE



PROFILE SECTION A-A
FOR VORTEX ROCK STRUCTURE



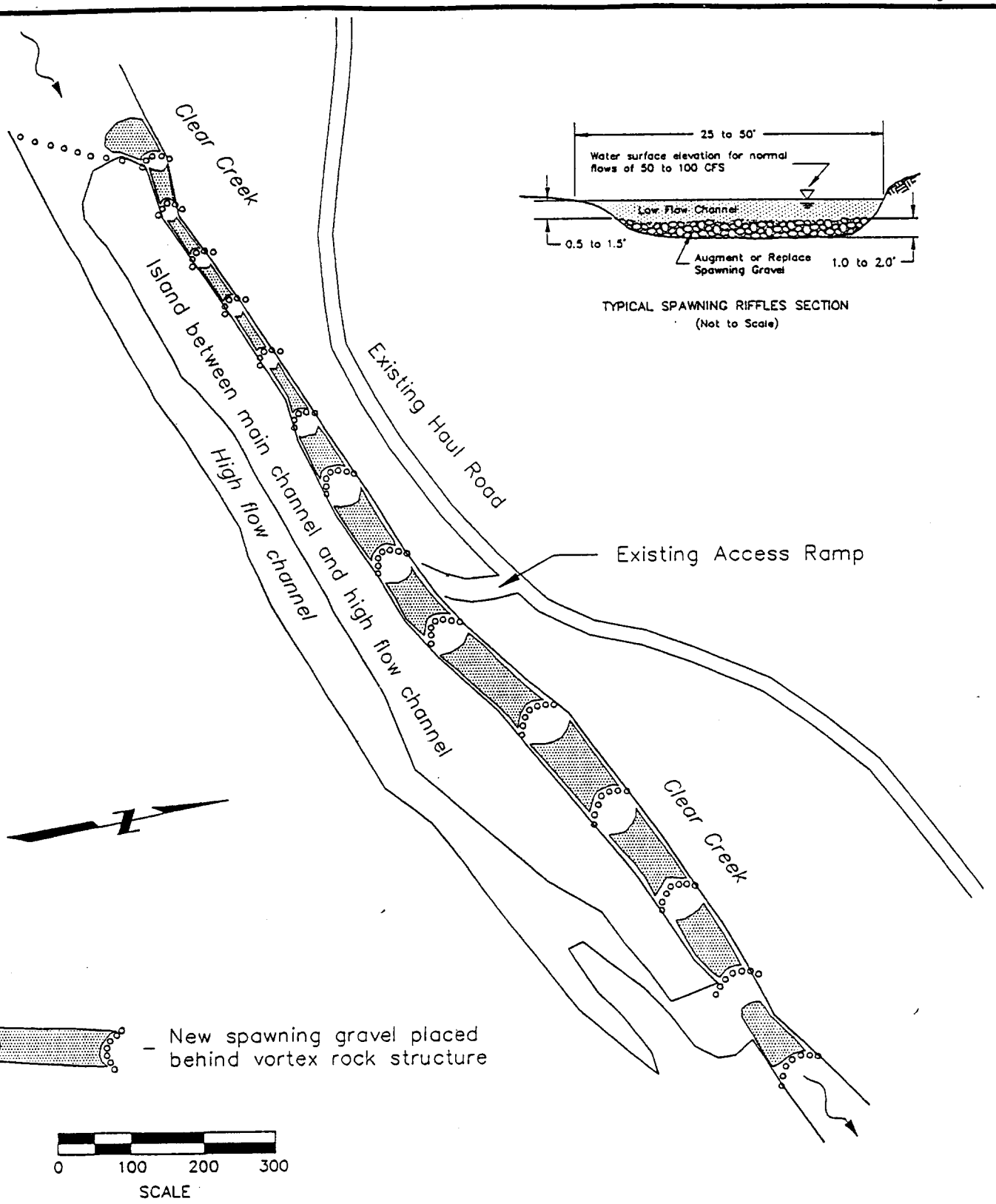
MEANDER SECTION



REVETMENT STRUCTURE

Typical Instream Structures

Figure 4



Typical Step-Pool Habitat Improvement Site

spawning areas. The design will include use of logs and boulders to provide pool and overhead cover for fish (Figure 6). Future habitat restoration maintenance work may include this type of channel stabilization at other sites.

Management Practices

Saeltzer Dam Maintenance Dredging

Management activities above the dam will include periodic dredging to remove accumulated sediment that accumulates at its base. The frequency of this procedure will be dependent on future runoff.

Projects may use a suction dredge system to remove new sediment. Material could be pumped up to 1 miles away to settling basins located above the flood plain. This material could then be used as fill or be processed for a commercial sand or gravel product. A suction dredge system would reduce turbidity that might overwise flow downstream during conventional excavation operations. Discharge water would be contained in settling basins, and percolate through the gravels.

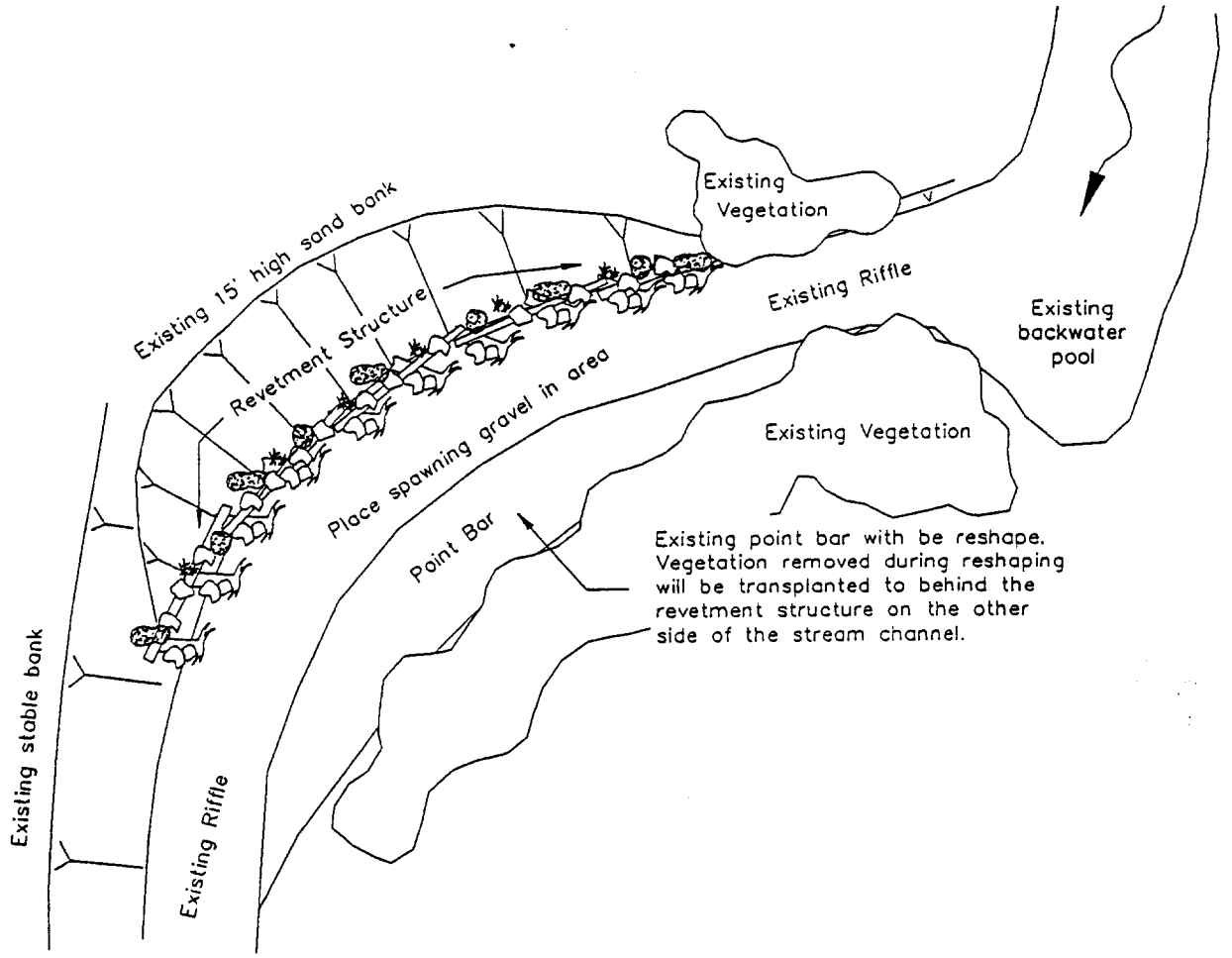
Habitat Restoration Sites

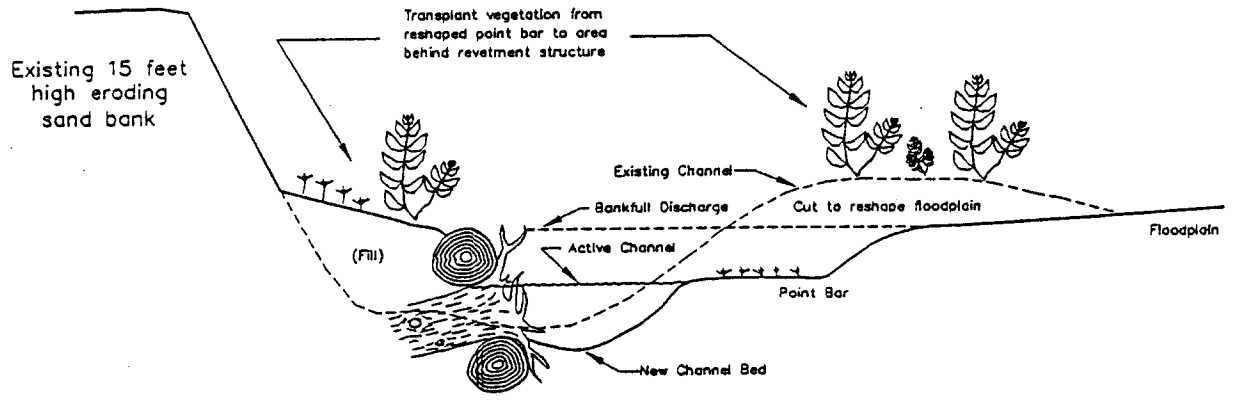
These sites will be monitored by DFG Biologists during redd surveys. They will observe sites for spawning activity, downstream movement of placed gravel, and damage to instream structures and will make recommendations for future restoration and management activities.

Project Relationship to Upper Sacramento River Fisheries and Riparian Management Plan

The Upper Sacramento River Fisheries and Riparian Management Plan calls for the purchase of land or easements along Clear Creek to allow long-term protection of riparian habitat. Also, increased flow releases from Whiskeytown Dam are proposed. Flows would be increased from 42,000 to 91,000 acre-feet annually, and provide about 150 cfs flows at Saeltzer Dam April through Mid-October and 200 cfs flows during the rest of the year.

Additionally, the plan identifies needs for maintenance dredging of Saeltzer Reservoir; mechanical ripping of existing gravel areas to improve natural spawning and food production; construction of instream structures from boulders, rock or wood (logs) to create new fish cover and resting habitat; and restoration of spawning riffles both below and above Saeltzer Dam.





REVETMENT STRUCTURE
CROSS-SECTIONAL VIEW

Typical Bank Stabalization And Habitat Improvement Site

The Clear Creek Fishery Habitat Project, while a component of the management plan, is not dependent upon other features being implemented to provide fishery benefits. In addition, construction of this project does not commit DWR, DFG or USBR to complete other components of the plan. When additional activities are proposed, environmental documents will be prepared to evaluate their effects.

The following sections described listed and candidate species that might be found near project areas. It also provides methods to prevent adverse effects to these species.

WILDLIFE SPECIES

Bald Eagle

The bald eagle is a permanent resident and common winter migrant in Shasta County. Since at least 1977 it has been restricted to breeding primarily in Butte, Lake, Lassen, Modoc, Plumas, Shasta, Siskiyou and Trinity counties. Approximately half of the winter population is concentrated in the Klamath Basin. It is principally found at lower elevations.

Bald eagles generally require large bodies of water providing an abundant source of fish or waterfowl and are seldom found far from the ocean, rivers or large lakes. They nest in large dominant live trees which are usually located near a permanent water source. Overmature ponderosa pine are used extensively for nesting in Shasta County. Eagles feed on waterfowl,fish and mammal carcasses. Groups of eagles may feed gregariously.

The bald eagle is both federal and state listed endangered. These birds are highly vulnerable to eggshell thinning induced by ingestion of DDT (dichloro-diphenyl trichloro-ethane) and its primary metabolite DDE (dichloro-diphenyl dichloro-ethylene). Human disturbance such as logging, recreational development and nest site disturbance have caused loss of productivity and territory abandonment.

Immature and adult bald eagles have been recorded flying through the Clear Creek watershed. The creek itself is narrow and shallow in parts and it is likely that these birds are nesting and feeding at the nearby Whiskeytown Reservoir or the Sacramento River.

Bald eagles do not currently nest along Clear Creek below Whiskeytown Reservoir. Sporadic use by wintering bald eagles does occur. Increased salmon spawning should provide wintering bald eagles with additional forage. Both spawned carcasses and live spawners will be taken. Increased pool to riffle ratio should increase the biomass of non-game fish in the project area. These non-game species are heavily utilized by foraging eagles.

Increased turbidity during dredging or project construction would represent a short term impact to foraging eagles which search visually for prey items in the stream. The proposed project will not significantly affect bald eagles or their habitat. However, some positive habitat improvement due to increased prey biomass are possible.

Osprey

The osprey breeds in northern California from the Cascade Range south to Lake Tahoe and along the coast south to Marin County. Populations of osprey nest at Shasta Lake, Eagle Lake, Lake Almanor and other inland lakes and reservoirs. California's breeding population is estimated at 350-400 pairs in Northern California.

The osprey is listed by the DFG as a species of special concern. A cause of their decline can be linked to the use of DDT (dichlore-diphenyl trichloro-ethane) which causes eggshell thinning.

Ospreys use large trees, snags, and man-made structures in canopy forest for nesting and cover. Nest locations are associated with large bodies of water that contain abundant sources of fish.

Osprey feed primarily on fish, but on occasion take mammals, birds, reptiles, amphibians, and invertebrates. Osprey have been reported at the Whiskeytown Reservoir.

Osprey rarely utilize small inland streams like Clear Creek for nesting. Osprey are neotropical migrants and are absent from California during the winter. The potential for osprey nesting on Clear Creek is low except for the area near it's junction with the Sacramento River. Increased fish populations produced by the project could provide increased foraging opportunities for any osprey nesting along the Sacramento River. Like bald eagles, osprey search visually for fish. Osprey use of Clear Creek is currently believed to be low. Increased short-term turbidity levels during construction could adversely effect foraging osprey. However, the duration of periods of turbidity is expected to be short, and the effects reduced with distance downstream from the work sites. Increased foraging use by osprey in the future is possible if fish habitat improvement measures are successful.

Bank Swallow

The bank swallow is a migratory species that is common in spring and fall in interior California. During the summer bank swallows inhabit areas with silty cliffs and banks that form the nesting colony. Formally bank swallows were common as breeding species in California. Currently, only a few breeding colonies remain within the state. The bank swallow has had recorded colonies along the upper Sacramento River near the mouth of Clear Creek.

Currently the bank swallow is listed as State Threatened by the DFG. The reasons for their decline in California are unclear however, State and federal bank "protection" are considered to be the primary threat to remaining bank swallow habitat.

Bank swallows use cliffs and banks for nesting that are almost vertical to reduce access by predators. The material is usually silty, with a clay content that helps to stabilize their burrows. Bank swallows use open riparian, grassland, and agricultural areas for foraging. The swallow feeds by hawking insects during long gliding flights. The area along Clear Creek is riparian habitat that would be suitable for insect hawking.

Although vertical cliffs and banks are found near the Clear Creek flood plain, project work will not include modifications to these banks. The 200-foot long bank stabilization project proposed for 1994 consists of a 15-foot high sand bar that is eroding into the creek at its base. The loose sand slopes down at about a 45 degree angle. This material, even if graded to vertical, lacks clay content and would not be suitable for constructing burrows. Sandy, gravelly soils found along lower Clear Creek are generally not suitable for bank swallow nesting. However, some of these vertical banks contain a distinct clay layer. This layer is compacted and quite hard. Bank swallows prefer silty soils rather than sand, gravel, or clay.

Very high flows are necessary to produce and maintain vertical cutbanks. These erosional events are moderated on rivers and streams below reservoirs with flood protection responsibilities. Releases from Whiskeytown Reservoir during major storm events are generally inadequate to produce or maintain the vertical cutbanks required by this species for nesting. Bank swallows are unlikely to use the project area. No adverse impacts to bank swallows or their habitat associated with the proposed project are anticipated.

Long-eared Owl

The long-eared owl is an uncommon permanent resident throughout most of the northeastern part of the state. Dense riparian habitat and live oak thickets are heavily used for roosting and nesting. Resident populations have declined in recent years.

The long-eared owl is listed by the DFG as a species of special concern. It is believed that loss of habitat and habitat fragmentation are the cause of its decline.

Nest sites are located in abandoned crow, magpie, hawk, heron, or squirrel nest in a wide variety of trees. Nests are rarely located in tree cavities or on the ground. Owls feed utilizing low gliding flights and pounce on their prey while on the ground. They usually feed in open fields and on occasion in wooded and forest habitats. They require riparian thickets with small densely canopied trees for roosting and nesting.

The small percentage of riparian growth necessary to clear access ramps at each project site is considered negligible. Project designers will avoid constructing roads and access ramps through live oak thickets. The proposed project will not adversely impact long-eared owls or their habitat.

Willow Flycatcher

The willow flycatcher is a rare to uncommon summer resident in wet meadow to montane riparian habitats at 2000 to 8000 feet in the Sierra Nevada and Cascades. It is a common spring and fall migrant in lower elevation riparian habitats throughout the state excluding the north coast.

The willow flycatcher is listed as a California endangered species and a Federal category 1 listing.

Willow flycatchers require dense willow thickets for roosting and nesting purposes. The largest populations of flycatchers have been found in dense low thickets of willows along water or meadows edges. The flycatcher feeds by making short sallies for flying insects from perches in willows.

Willow flycatchers are not known to nest along Clear Creek. Improved willow retention and growth below flood control reservoirs related to decreased frequency of scouring flows has been observed. It is likely that willow densities along Clear Creek have improved with the construction and operation of Whiskeytown Reservoir. The extent of willow flycatcher use of lower Clear Creek is unknown.

Even though suitable willow habitat exists along Clear Creek no impact is expected, roads and entry sites along the creek will be directed away from dense streamside riparian habitat. The small percentage of riparian growth necessary to clear access ramps at each project site is considered negligible. The proposed project will not adversely impact willow flycatchers or their habitat.

Yellow Warbler

The yellow warbler was a common resident in northern California and locally common in southern California. They breed in montane chaparral, open ponderosa pine and mixed conifer habitats. In recent years the number of breeding pairs has declined in lowland areas (southern coast, Colorado River, San Joaquin and Sacramento Valleys) and is now rare where it once was common.

Currently the yellow warbler is listed as a DFG-SPC.

The yellow warbler is usually found in riparian deciduous habitats in summer: cottonwoods, willows, alders, and other small trees and shrubs typical of low open canopy riparian woodland.

During other times of the year they utilize woodland, forest, and shrub habitats. Areas adjacent to Clear Creek contain riparian and woodland habitat that would be suitable for the yellow warbler. Existing roads will be used in upland areas. The small percentage of riparian habitat impacted by access ramps at each construction site is considered negligible. The proposed project will not adversely impact yellow warblers or their habitat.

Yellow-breasted Chat

The yellow-breasted chat is an uncommon summer resident and migrant in coastal California and the foothills of the Sierra Nevada. During migration they are found in lower elevations of mountains in riparian habitat.

Currently the yellow-breasted chat is listed as DFG-SPC due to the loss of habitat.

The yellow-breasted chat eats insects, fruits, and berries that they capture from the foliage of small shrubs and trees along riparian thickets and brushy tangles near water courses. Surveys for yellow-breasted chat should be completed before any removal of blackberry thickets planned between April 15 and August 1. The loss of thick riparian habitat near the creek's edge is not expected since access to restoration sites will occur where vegetation is minimal to reduce the loss of existing habitat. The proposed project will not adversely impact yellow-breasted chats or their habitat.

Chinook Salmon (Spring-run)

There are four distinct races of chinook salmon in the Sacramento-San Joaquin River system. These fish are named for the time of year that they enter freshwater to begin their spawning migration. Two races of salmon formerly spawned in the Clear Creek drainage, they were the fall- and spring-run salmon. Spring-run salmon have not been observed in Clear Creek for several decades. Recent attempts to reintroduce spring-run from Feather River stocks above Saeltzer Dam, appears to have met with little success. Of these two races the spring-run is listed as a species of special concern by the DFG. Recent spawner counts on the Feather River place the level of spawners at 1,660 individuals.

The decline of the spring-run salmon results from increased competition with fall spawners due to forces co-existence within the same geographical areas and high water export rates during the time of juvenile fish outmigration. In addition, the spring-run salmon is included in with the counts of fall-run salmon since they spawn in and during the fall-run time frame.

If in the future, spring-run are identified in the creek, project designers will confer with DFG biologists to minimize the impact of instream construction.

Placement of gravel or other channel work at each site will be of short duration (one to two days). Since work will be localized, and not done in deep resting pools, there should be no impact on mature fish.

Dredging of Saeltzer Reservoir could occur during the migrating season. DFG biologists will be asked to specify dates that dredging will not impact the fish, and steps to prevent damage if spring-run pass the fish ladder. Closing the fish ladder during the active dredging work is one possible alternative.

Spawning of spring-run is only expected in the reaches above Saeltzer Dam where waters are cooler. Therefore, spawning should not be impacted by work downstream.

Downstream migration of spring-run is mostly during the winter months, outside the normal construction season. DFG will be asked to provide dates when spring-run out migration will not be impacted by construction.

This project is specifically designed to improve salmon habitat. No short or long-term impacts related to the proposed project have been identified. The goal of the project is to increase the quantity and quality of spawning gravel, improve pool/riffle ratios, decrease downstream sedimentation, increased benthic macroinvertebrate diversity and biomass, increased overhead and instream cover, and possibly eliminate increases in stream temperatures below Saeltzer Dam.

Red-legged Frog

The California reg-legged frog occurs west of the Sierra-Cascade crest and along the coast ranges the entire length of the state usually below 3900 feet. Their habitat consists of quiet, permanent pools of streams, marshes, and occasionally ponds, they prefer shorelines with extensive vegetation.

The red-legged frog is designated as a Category 2 candidate species by the USFWS and as a species of special concern by DFG.

This is a highly aquatic species with little movement away from streamside habitats. The frogs have periods of inactivity from late summer to early winter.

Breeding takes place from January to July with a peak in February in the south and March to July in the north. Females lay 750 to 4,000 eggs in cluster up to 10 inches across attached to vegetation 2 to 6 inches below the surface of permanent pools. Tadpoles require 11 to 20 weeks to reach metamorphosis.

The red-legged frog is not expected to occur within the project area, primarily because of the occurrence of bullfrogs which displace and prey upon red-legged frogs. Therefore, the project is unlikely to adversely impact red-legged frogs.

Southwestern Pond Turtle

The southwestern pond turtle, is distributed from Washington south to Baja California. Many populations have been reduced or extirpated, especially where aquatic habitats have been modified or eliminated.

The U.S. Fish and Wildlife Service has declined to list the southwestern pond turtle as threatened or endangered. As the human population continues to grow in California, riparian corridors and the water itself in many of the creeks will come under increasing demand for urban and agricultural uses. Without some protection of the creeks, associated uplands areas, and riparian corridors, the long-term survival of pond turtle populations in California can not be assured.

Pond turtle nesting, occurs in sand banks along the courses of large rivers, or hillsides in foothill regions. Nesting can occur up to 400 meters from, and 60 to 90 meters above, streambeds. Along the central California coast, mating occurs in April and May, and eggs are laid from June through August. Hatchlings over-winter in nests and emerge in March and April. Incubation in captivity takes 73 to 80 days, and hatchlings may over-winter in nests.

The project has limited potential to improve southwestern pond turtle habitat. The shallow, wide riffle areas of lower Clear Creek currently provide little suitable turtle habitat. Increased pool/riffle ratio and the introduction of structure (logs, boulders, root wads etc.) to the creek should improve foraging habitat and cover, respectively. The placement of root wads and logs along the waterline in Saeltzer Dam after sediment removal could help mitigate any short-term loss of shoreline or submerged aquatic cover.

PLANT SPECIES

Silky Cryptantha

Silky cryptantha is a member of the Boraginaceae, commonly called the Forget-me-not family. It ranges in height from 15.0 cm to 30.0 cm. The silky cryptantha is restricted to Shasta and Tehama counties in gravel streambeds below 1000 feet in valley and foothill grasslands and cismontane woodlands.

Red Bluff Dwarf Rush

Red Bluff dwarf rush is a small (1" to 4-1/2") annual which occurs within the margins of vernal pools and other wet places. Surrounding habitat is usually woodland or chaparral. It occurs below 1500′ in Shasta, Tehama and Butte counties only.

Dimorphic snapdragon

The dimorphic snapdragon is a small to medium height annual member of the snapdragon family (Scrophulariaceae). The plants are erect but may cling to adjacent shrubs with terrdril-like branches. The flowers have a typical snapdragon appearance and are off-white in color. Habitat is gently to steep slopes, primarily south and west facing, of serpentine or Lodo Shale. It is restricted to areas below 2500′ in the central portions of the North Coast Range.

Clear Creek was at one time mined for gravel and extensive tailings occur around the sites in which the spawning gravel is to be placed. Access routes may cross areas containing gravel bars, serpentine or shale. Wet seep areas and vernal pools may be found near these routes. To assure that populations of listed plants are not impacted, all routes used to construct the roads will be surveyed by a DWR Botanist. If listed plants are found, these areas will be avoided.

PROJECT EFFECTS OF THE PROPOSED ACTION ON LISTED AND CANDIDATE SPECIES

Construction of the CCFHRP and post construction management have the potential to impact listed and candidate species in different ways. Following are discussions of how the proposed CCFHRP could affect these species. Also discussed are methods the Department has proposed to avoid, reduce or mitigate these impacts.

PROJECT CONDITIONS

CESA (Sections 2091 and 2092) requires the DFG to determine and specify reasonable and prudent alternatives consistent with conserving sensitive species, which would prevent jeopardy to the continued existence of the species. The following project conditions constitute alternatives that in DWR's view will allow the implementation of the Clear Creek Fishery Habitat Restoration Project and avoid jeopardizing any listed species, or result in the destruction or adverse modification of habitat essential to the continued existence of these species:

Both bald eagle and osprey could be adversely impacted by short-term increases in turbidity. However, by diverting water around the dredging at Saeltzer Dam, prewashing gravels before placement, and using a short time frame for instream construction activities this impact will be minimized. Successful fisheries restoration will increase prey species population in the project area and result in long-term habitat improvement for both bald eagles and osprey.

The sandy-gravelly soils present within the project area are generally not suitable for bank swallow nesting. The proposed project will not adversely impact bank swallows or their habitat.

The proposed project does not contain any opportunities to improve bank swallow habitat.

Long-eared owls prefer dense live oak thickets and riparian habitat for roosting. All live oak thickets will be avoided during project construction.

Willow flycatcher, yellow warbler, and yellow-breasted chat are all dependent upon riparian habitat. Long-eared owls also utilize this habitat for roosting. Although loss of riparian vegetation is predicted to be negligible, project access roads will be flagged and inspected by Department biologists prior to construction to insure minimization of impacts. Unavoidable loss of riparian habitat will be quantified, reported, and replaced. Replacement may not occur at the impact site due to the reoccurring need to replace spawning gravel or perform dredging activities.

This project is specifically designed to improve salmon habitat. No short or long-term impacts to salmon or their habitat related to the proposed project have been identified. The goal of the project is to increase the quantity and quality of spawning gravel, improve pool/riffle ratios, decrease downstream sedimentation, increase benthic macroinvertebrate diversity and biomass, increase overhead and instream cover, and possibly reduce stream temperatures below Saeltzer Dam.

Removal of shoreline cover and emergent structure could adversely impact southwestern pond turtle habitat at Saeltzer Reservoir. However, the proposed project offers opportunities to improve southwestern pond turtle habitat by increasing pool/riffle ratios, and by the introduction of emergent structure (logs, root wads, and boulders) below Saeltzer Dam. Placement of emergent cover (logs, boulders, or rootwads) in Saeltzer Reservoir after dredging could provide basking sites and cover for pond turtles while shoreline vegetation recovers from project related impacts. All silky cryptantha, Red Bluff dwarf rush and diamorphic snapdragon sites discovered during botanical surveys within the project area will be avoided.

INCIDENTAL TAKE

Pursuant to Section 2090 of CESA, the DFG will make a finding as to whether the potential exists for take incidental to the project. Section 2091 of CESA requires the DFG to determine and specify to the State Lead Agency "reasonable and prudent measures that are necessary and appropriate to minimize the adverse impacts of the incidental taking." The DFG will determine if implementation of the Project Conditions identified in this assessment will avoid any "incidental" take of sensitive species.

CONCLUSIONS

If the project construction and operation conditions in this Biological Assessment are implemented, then it is the DWR's opinion that implementation of the CCFHRP will not jeopardize the continued existence of any listed species or result in the incidental take of those species.

Ralph N. Hinton, Chief
Water Management Branch
Northern District

Date: 12/8/93

December 13, 1993

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601 Locust Street
Redding, California 96001

Clear Creek Fisheries Habitat Restoration Project Biological Assessment Supplement

On December 9, 1993, your office notified the Department of Water Resources of the location of a previously unknown bank swallow colony within the project area of the Clear Creek Fisheries Habitat Restoration Project. After review of the project design it is clear that the bank swallow colony is in no way threatened by the proposed project. The nearest project site where work is planned (spawning gravel recruitment) is approximately one-quarter mile upstream from the colony location.

I have identified the location of the colony (per our phone conversation) on the attached map as well as on a photocopy of an aerial false color infra-red photograph. These maps will be included in the project planning to insure the colony is not disturbed. No equipment entry will be allowed in this area.

Although the colony is not threatened by the proposed project some potential exists for maintenance of the colony site as part of the proposed project. Replacement of spawning gravel will occur periodically. Heavy equipment will be required to place these gravels in the stream channel. This same equipment can be used to maintain the vertical cutbank (required by bank swallows for nesting) in a vertical condition. These habitat improvements can be performed by the DWR contractors under your supervision.

If you have any question or recommendations related to the proposed project's effect on the bank swallow colony, please call me at (916) 529-7329.

Dave Bogener
Environmental Specialist IV

Enclosures

California Department of Fish and Game
Natural Diversity Data Base
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Species/Community Location Summary Report

REAT VALLEY COTTONWOOD RIPARIAN FOREST ID: CTT61410CA
Great Valley Cottonwood Riparian Forest

---------Status--------	NDDB Element Ranks	-------Other Lists-------
Federal: None	Global: G2	CDFG: No
State: None	State: S2.1	Audubon:
		CNPS List:
		CNPS RED Code:

Occurrence Number: 20
Quality: Fair --Dates Last Seen--
Type: Natural/Native occurrence Element: 1985/08/03
Presence: Presumed Extant Site: 1985/08/03
Trend: Unknown
Quad Summary: Cottonwood (4012243), Balls Ferry (4012242)
County(ies): Shasta
Location: BOTH SIDES OF SACRAMENTO RIVER AT CONFL W/ STILLWATER CR & UP STILLWATER CR TO DERSCH RD.
Lat/Long: 40d 28m 01s / 122d 15m 14s Township: 30N
UTM: Zone-10 N4479635 E563264 Range: 03W
Mapping Precision: SPECIFIC (0 Mile) Section: 07 XX Qt
Symbol Type: POLYGON Meridian: M
Map Index Numbers - Group: 09565 Acres: 377.4
Detail: 09565 Elevation: 390 ft

California Department of Fish and Game
Natural Diversity Data Base
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Species/Community Location Summary Report

GREAT VALLEY VALLEY OAK RIPARIAN FOREST ID: CTT61430CA
Great Valley Valley Oak Riparian Forest

---------Status--------	NDDB Element Ranks	-------Other Lists-------
Federal: None	Global: G1	CDFG: No
State: None	State: S1.1	Audubon:
		CNPS List:
		CNPS RED Code:

Occurrence Number: 14
Quality: Unknown --Dates Last Seen--
Type: Natural/Native occurrence Element: 1985/08/01
Presence: Presumed Extant Site: 1985/08/01
Trend: Unknown
Quad Summary: Cottonwood (4012243)
County(ies): Shasta
Location: W SIDE OF SACRAMENTO RIVER ABOUT 2 MI U/S OF I-5 BRIDGE.
Lat/Long: 40d 29m 08s / 122d 19m 48s Township: 30N
UTM: Zone-10 N4481655 E556785 Range: 04W
Mapping Precision: NON-SPECIFIC (1/5 Mile) Section: UN XX Qt
Symbol Type: POINT Meridian: M
Map Index Numbers - Group: 09366 Acres: 0
Detail: 09366 Elevation: 410 ft

Occurrence Number: 15
Quality: Fair --Dates Last Seen--
Type: Natural/Native occurrence Element: 1985/08/03
Presence: Presumed Extant Site: 1985/08/03
Trend: Unknown
Quad Summary: Cottonwood (4012243)
County(ies): Shasta
Location: N SIDE OF SACRAMENTO RIVER JUST D/S OF THE NORTH ST BRIDGE, BELOW RIVERVIEW RANCH, RM 283.
Lat/Long: 40d 28m 21s / 122d 16m 47s Township: 30N
UTM: Zone-10 N4480236 E561066 Range: 04W
Mapping Precision: SPECIFIC (0 Mile) Section: 11 XX Qt
Symbol Type: POLYGON Meridian: M
Map Index Numbers - Group: 09459 Acres: 198.6
Detail: 09459 Elevation: 400 ft

Occurrence Number: 16
Quality: Unknown --Dates Last Seen--
Type: Natural/Native occurrence Element: 1985/08/03
Presence: Presumed Extant Site: 1985/08/03
Trend: Unknown
Quad Summary: Cottonwood (4012243)
County(ies): Shasta
Location: S SIDE SACRAMENTO RIV ABOUT 2 MI D/S OF NORTH ST BRIDGE, ANDERSON.
Lat/Long: 40d 28m 06s / 122d 16m 03s Township: 30N
UTM: Zone-10 N4479799 E562100 Range: 04W
Mapping Precision: SPECIFIC (0 Mile) Section: 00 XX Qt
Symbol Type: POLYGON Meridian: M
Map Index Numbers - Group: 09483 Acres: 85.2
Detail: 09483 Elevation: 395 ft

California Department of Fish and Game
Natural Diversity Data Base
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Species/Community Location Summary Report

EAT VALLEY VALLEY OAK RIPARIAN FOREST
eat Valley Valley Oak Riparian Forest

ID: CTT61430CA

currence Number: 17
Quality: Fair
Type: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: Enterprise (4012253), Cottonwood (4012243)
County(ies): Shasta
Location: EAST BANK OF SACRAMENTO RIVER, W OF PACHECO SCHOOL, BETW ANDERSON & ENTERPRISE.
Lat/Long: 40d 30m 10s / 122d 21m 00s
UTM: Zone-10 N4483545 E555075
Mapping Precision: SPECIFIC (0 Mile)
Symbol Type: POLYGON
Map Index Numbers - Group: 09330
Detail: 09330

--Dates Last Seen--
Element: 1985/08/02
Site: 1985/08/02

Township: 31N
Range: 04W
Section: 32 NW Qt
Meridian: M
Acres: 155.7
Elevation: 420 ft

California Department of Fish and Game
Natural Diversity Data Base
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Species/Community Location Summary Report

GREAT VALLEY WILLOW SCRUB ID: CTT63410CA
Great Valley Willow Scrub

---------Status--------	NDDB Element Ranks	-------Other Lists-------
Federal: None	Global: G3	CDFG: No
State: None	State: S3	Audubon:
		CNPS List:
		CNPS RED Code:

Occurrence Number: 8
Quality: Unknown
Type: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: Cottonwood (4012243)
County(ies): Shasta
Location: ISLANDS IN SACRAMENTO RIVER ABOUT 3 MI DUE W OF REDDING AIRPORT.
Lat/Long: 40d 29m 46s / 122d 20m 31s
UTM: Zone-10 N4482820 E555764
Mapping Precision: NON-SPECIFIC (1/5 Mile)
Symbol Type: POINT
Map Index Numbers - Group: 09343
Detail: 09343

--Dates Last Seen--
Element: 1985/08/02
Site: 1985/08/02

Township: 31N
Range: 04W
Section: UN XX Qt
Meridian: M
Acres: 0
Elevation: 410 ft

California Department of Fish and Game
Natural Diversity Data Base
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Species/Community Location Summary Report

CRYPTANTHA CRINITA — ID: PDBOR0A0Q0
Silky Cryptantha

Status	NDDB Element Ranks	Other Lists
Federal: Category 2	Global: G1	CDFG: No
State: None	State: S1.1	Audubon:
		CNPS List: 1B
		CNPS RED Code: 3-2-3

Occurrence Number: 4
Quality: Unknown — --Dates Last Seen--
Type: Natural/Native occurrence — Element: 1940/05/01
Presence: Presumed Extant — Site: 1940/05/01
Trend: Unknown
Quad Summary: Hooker (4012233), Cottonwood (4012243)
County(ies): Shasta, Tehama
Location: 1 MI S OF COTTONWOOD, ALONG U.S. HWY #99.
Lat/Long: 40d 21m 52s / 122d 17m 02s — Township: 29N
UTM: Zone-10 N4468243 E560802 — Range: 04W
Mapping Precision: NON-SPECIFIC (1 Mile) — Section: 14 SW Qt
Symbol Type: POINT — Meridian: M
Map Index Numbers - Group: 09442 — Acres: 0
Detail: 09442 — Elevation: 420 ft

Occurrence Number: 11
Quality: Unknown — --Dates Last Seen--
Type: Natural/Native occurrence — Element: XXXX/XX/XX
Presence: Presumed Extant — Site: XXXX/XX/XX
Trend: Unknown
Quad Summary: Bend (4012232), Hooker (4012233), Balls Ferry (4012242), Cottonwood (4012243)
County(ies): Tehama
Location: COTTONWOOD CANAL, NEAR COTTONWOOD-ELVERTA #3 TRANSMISSION LINE.
Lat/Long: 40d 22m 04s / 122d 14m 34s — Township: 29N
UTM: Zone-10 N4468642 E564290 — Range: 03W
Mapping Precision: NON-SPECIFIC (1 Mile) — Section: 18 XX Qt
Symbol Type: POINT — Meridian: M
Map Index Numbers - Group: 09507 — Acres: 0
Detail: 09507 — Elevation: 450 ft

California Department of Fish and Game
Natural Diversity Data Base
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Species/Community Location Summary Report

CRYPTANTHA CRINITA
Silky Cryptantha
ID: PDBOR0A0Q0

Occurrence Number: 13
Quality: Unknown
Type: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: Cottonwood (4012243)
County(ies): Shasta
Location: ALONG OLINDA CREEK, S OLINDA RD, W OF ANDERSON. ALSO IN SEC 22, W HALF.
Lat/Long: 40d 26m 26s / 122d 18m 40s
UTM: Zone-10 N4476673 E558425
Mapping Precision: SPECIFIC (0 Mile)
Symbol Type: POLYGON
Map Index Numbers - Group: 09380
Detail: 09380

--Dates Last Seen--
Element: 1987/09/13
Site: 1987/09/13

Township: 30N
Range: 04W
Section: 21 E Qt
Meridian: M
Acres: 33.4
Elevation: 460 ft

California Department of Fish and Game
Natural Diversity Data Base
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Species/Community Location Summary Report

ORCUTTIA TENUIS
Slender Orcutt Grass
ID: PMPOA4G050

--------Status--------	NDDB Element Ranks	-------Other Lists-------
Federal: Category 1	Global: G2	CDFG: No
State: Endangered	State: S2.2	Audubon:
		CNPS List: 1B
		CNPS RED Code: 2-3-3

Occurrence Number: 1
Quality: Unknown
Type: Natural/Native occurrence
Presence: Presumed Extant
Trend: Decreasing
Quad Summary: Enterprise (4012253), Cottonwood (4012243)
County(ies): Shasta
Location: STILLWATER PLAINS; ABOUT 1.7 MI DUE E OF THE S END OF MAIN RUNWAY OF REDDING MUN AIRPORT.
Lat/Long: 40d 30m 04s / 122d 15m 35s
UTM: Zone-10 N4483430 E562727
Mapping Precision: NON-SPECIFIC (1/5 Mile)
Symbol Type: POINT
Map Index Numbers - Group: 09491
Detail: 09491

--Dates Last Seen--
Element: 1984/10/09
Site: 1984/10/09

Township: 31N
Range: 04W
Section: 36 NE Qt
Meridian: M
Acres: 0
Elevation: 480 ft

Occurrence Number: 3
Quality: None
Type: Natural/Native occurrence
Presence: Extirpated
Trend: Unknown
Quad Summary: Enterprise (4012253), Cottonwood (4012243)
County(ies): Shasta
Location: REDDING AIRPORT BETWEEN AIRPORT RD & RUNWAYS OF TOWER.
Lat/Long: 40d 30m 09s / 122d 17m 53s
UTM: Zone-10 N4483557 E559478
Mapping Precision: NON-SPECIFIC (1/5 Mile)
Symbol Type: POINT
Map Index Numbers - Group: 09417
Detail: 09417

--Dates Last Seen--
Element: 1979/XX/XX
Site: 1984/09/24

Township: 31N
Range: 04W
Section: 34 NE Qt
Meridian: M
Acres: 0
Elevation: 480 ft

Occurrence Number: 6
Quality: None
Type: Natural/Native occurrence
Presence: Extirpated
Trend: Unknown
Quad Summary: Cottonwood (4012243)
County(ies): Shasta
Location: STILLWATER PLAINS, 3 MI N OF ANDERSON.
Lat/Long: 40d 29m 32s / 122d 17m 32s
UTM: Zone-10 N4482420 E559981
Mapping Precision: NON-SPECIFIC (1/5 Mile)
Symbol Type: POINT
Map Index Numbers - Group: 09432
Detail: 09432

--Dates Last Seen--
Element: 1958/XX/XX
Site: 1982/06/11

Township: 31N
Range: 04W
Section: 35 SW Qt
Meridian: M
Acres: 0
Elevation: 480 ft

RCUTTIA TENUIS ID: PMPOA4G050
lender Orcutt Grass

Occurrence Number: 7
Quality: None --Dates Last Seen--
Type: Natural/Native occurrence Element: 1958/XX/XX
Presence: Extirpated Site: 1982/06/11
Trend: Unknown
Quad Summary: Cottonwood (4012243)
County(ies): Shasta
Location: 3.3 MI N OF ANDERSON ON THE STILLWATER PLAINS. (ALSO LOCATEDIN SW 1/4 SEC 35.)
Lat/Long: 40d 29m 41s / 122d 17m 41s Township: 31N
UTM: Zone-10 N4482696 E559767 Range: 04W
Mapping Precision: NON-SPECIFIC (1/5 Mile) Section: 34 SE Qt
Symbol Type: POINT Meridian: M
Map Index Numbers - Group: 09423 Acres: 0
Detail: 09423 Elevation: 480 ft

Occurrence Number: 8
Quality: None --Dates Last Seen--
Type: Natural/Native occurrence Element: 1958/XX/XX
Presence: Extirpated Site: 1982/06/11
Trend: Unknown
Quad Summary: Cottonwood (4012243), Enterprise (4012253)
County(ies): Shasta
Location: STILLWATER PLAINS, 3.8 MI OF ANDERSON.
Lat/Long: 40d 29m 54s / 122d 17m 55s Township: 31N
UTM: Zone-10 N4483094 E559434 Range: 04W
Mapping Precision: NON-SPECIFIC (1/5 Mile) Section: 34 SE Qt
Symbol Type: POINT Meridian: M
Map Index Numbers - Group: 09416 Acres: 0
Detail: 09416 Elevation: 480 ft

Occurrence Number: 22
Quality: Unknown --Dates Last Seen--
Type: Natural/Native occurrence Element: 1987/09/13
Presence: Presumed Extant Site: 1987/09/13
Trend: Decreasing
Quad Summary: Balls Ferry (4012242), Cottonwood (4012243)
County(ies): Shasta
Location: VERNAL POOLS NW OF JCT DERSCH & DESCHUTES RDS, STILLWATER PLAINS. HAWES RANCH.
Lat/Long: 40d 28m 49s / 122d 14m 54s Township: 30N
UTM: Zone-10 N4481125 E563712 Range: 03W
Mapping Precision: NON-SPECIFIC (1/5 Mile) Section: 06 NE Qt
Symbol Type: POINT Meridian: M
Map Index Numbers - Group: 09506 Acres: 0
Detail: 09506 Elevation: 425 ft

California Department of Fish and Game
Natural Diversity Data Base
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Species/Community Location Summary Report

RCUTTIA TENUIS — ID: PMPOA4G050
Slender Orcutt Grass
Occurrence Number: 29

Quality:	Unknown	--Dates Last Seen--	
Type:	Natural/Native occurrence	Element:	1984/09/24
Presence:	Presumed Extant	Site:	1984/09/24
Trend:	Unknown		
Quad Summary:	Cottonwood (4012243), Enterprise (4012253)		
County(ies):	Shasta		
Location:	ABOUT 0.2 MI E OF S END OF MAIN (N-S) RUNWAY OF REDDING MUNCIPAL AIRPORT.		
Lat/Long:	40d 29m 59s / 122d 17m 22s	Township:	31N
UTM:	Zone-10 N4483255 E560210	Range:	04W
Mapping Precision:	NON-SPECIFIC (1/5 Mile)	Section:	35 NW Qt
Symbol Type:	POINT	Meridian:	M
Map Index Numbers - Group:	09444	Acres:	0
Detail:	09444	Elevation:	480 ft

California Department of Fish and Game
Natural Diversity Data Base
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Species/Community Location Summary Report

PARIA RIPARIA ID: ABPAU08010
nk Swallow

---------Status---------	NDDB Element Ranks	-------Other Lists-------
Federal: None	Global: G5	CDFG: No
State: Threatened	State: S2S3	Audubon:
		CNPS List:
		CNPS RED Code:

currence Number: 63
Quality: Unknown --Dates Last Seen--
Type: Natural/Native occurrence Element: 1987/05/29
Presence: Presumed Extant Site: 1987/05/29
Trend: Increasing
Quad Summary: Enterprise (4012253)
County(ies): Shasta
Location: SACRAMENTO RIVER MILE 291.8, LEFT BANK, ON THE SOUTH END OF REDDING.
Lat/Long: 40d 32m 06s / 122d 21m 10s Township: 31N
UTM: Zone-10 N4487129 E554814 Range: 04W
Mapping Precision: NON-SPECIFIC (1/5 Mile) Section: 19 NE Qt
Symbol Type: POINT Meridian: M
Map Index Numbers - Group: 09324 Acres: 0
Detail: 09324 Elevation: 430 ft

California Department of Fish and Game
Natural Diversity Data Base
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Species/Community Location Summary Report

GREAT VALLEY COTTONWOOD RIPARIAN FOREST ID: CTT61410CA
Great Valley Cottonwood Riparian Forest

---------Status--------	NDDB Element Ranks	-------Other Lists-------
Federal: None	Global: G2	CDFG: No
State: None	State: S2.1	Audubon:
		CNPS List:
		CNPS RED Code:

Occurrence Number: 21
Quality: Good --Dates Last Seen--
Type: Natural/Native occurrence Element: 1985/08/02
Presence: Presumed Extant Site: 1985/08/02
Trend: Unknown
Quad Summary: Enterprise (4012253), Redding (4012254)
County(ies): Shasta
Location: UPSTREAM OF HWY 44-299 BRIDGE OVER SACRAMENTO RIVER, ON WEST(S) BANK, REDDING.
Lat/Long: 40d 35m 25s / 122d 22m 21s Township: 32N
UTM: Zone-10 N4493255 E553091 Range: 05W
Mapping Precision: SPECIFIC (0 Mile) Section: 36 NE Qt
Symbol Type: POLYGON Meridian: M
Map Index Numbers - Group: 09288 Acres: 109.8
Detail: 09288 Elevation: 480 ft

Occurrence Number: 22
Quality: Good --Dates Last Seen--
Type: Natural/Native occurrence Element: 1985/08/02
Presence: Presumed Extant Site: 1985/08/02
Trend: Unknown
Quad Summary: Enterprise (4012253)
County(ies): Shasta
Location: E OF SACRAMENTO RIV BETW RANCH & SMITH RDS & ON ISLANDS DUE E OF LIVE OAK SCHOOL.
Lat/Long: 40d 32m 00s / 122d 21m 19s Township: 31N
UTM: Zone-10 N4486952 E554612 Range: 04W
Mapping Precision: SPECIFIC (0 Mile) Section: 19 E Qt
Symbol Type: POLYGON Meridian: M
Map Index Numbers - Group: 09311 Acres: 84.2
Detail: 09311 Elevation: 450 ft

California Department of Fish and Game
Natural Diversity Data Base
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Species/Community Location Summary Report

GREAT VALLEY VALLEY OAK RIPARIAN FOREST ID: CTT61430CA
Great Valley Valley Oak Riparian Forest

---------Status---------	NDDB Element Ranks	-------Other Lists-------
Federal: None	Global: G1	CDFG: No
State: None	State: S1.1	Audubon:
		CNPS List:
		CNPS RED Code:

Occurrence Number: 17
Quality: Fair --Dates Last Seen--
Type: Natural/Native occurrence Element: 1985/08/02
Presence: Presumed Extant Site: 1985/08/02
Trend: Unknown
Quad Summary: Enterprise (4012253), Cottonwood (4012243)
County(ies): Shasta
Location: EAST BANK OF SACRAMENTO RIVER, W OF PACHECO SCHOOL, BETW ANDERSON & ENTERPRISE.
Lat/Long: 40d 30m 10s / 122d 21m 00s Township: 31N
UTM: Zone-10 N4483545 E555075 Range: 04W
Mapping Precision: SPECIFIC (0 Mile) Section: 32 NW Qt
Symbol Type: POLYGON Meridian: M
Map Index Numbers - Group: 09330 Acres: 155.7
Detail: 09330 Elevation: 420 ft

Occurrence Number: 28
Quality: Poor --Dates Last Seen--
Type: Natural/Native occurrence Element: 1985/08/02
Presence: Presumed Extant Site: 1985/08/02
Trend: Decreasing
Quad Summary: Enterprise (4012253)
County(ies): Shasta
Location: EAST SIDE OF SACRAMENTO RIVER UPSTREAM OF SMITH RD, S OF ENTERPRISE.
Lat/Long: 40d 31m 22s / 122d 21m 17s Township: 31N
UTM: Zone-10 N4485768 E554666 Range: 04W
Mapping Precision: SPECIFIC (0 Mile) Section: 19 SE Qt
Symbol Type: POLYGON Meridian: M
Map Index Numbers - Group: 09315 Acres: 110.2
Detail: 09315 Elevation: 430 ft

California Department of Fish and Game
Natural Diversity Data Base
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Species/Community Location Summary Report

GREAT VALLEY WILLOW SCRUB ID: CTT63410CA
Great Valley Willow Scrub

---------Status---------	NDDB Element Ranks	-------Other Lists-------
Federal: None	Global: G3	CDFG: No
State: None	State: S3	Audubon:
		CNPS List:
		CNPS RED Code:

Occurrence Number: 9
Quality: Unknown --Dates Last Seen--
Type: Natural/Native occurrence Element: 1985/08/02
Presence: Presumed Extant Site: 1985/08/02
Trend: Unknown
Quad Summary: Enterprise (4012253)
County(ies): Shasta
Location: ISLANDS IN SACRAMENTO RIVER JUST UPSTREAM OF CONFL W/OLNEY CR, BETW ANDERSON & ENTERPRISE
Lat/Long: 40d 30m 46s / 122d 21m 43s Township: 31N
UTM: Zone-10 N4484669 E554064 Range: 04W
Mapping Precision: NON-SPECIFIC (1/5 Mile) Section: UN XX Qt
Symbol Type: POINT Meridian: M
Map Index Numbers - Group: 09301 Acres: 0
Detail: 09301 Elevation: 420 ft

California Department of Fish and Game
Natural Diversity Data Base
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Species/Community Location Summary Report

CRYPTANTHA CRINITA — ID: PDBOR0A0Q0
Silky Cryptantha

Status	NDDB Element Ranks	Other Lists
Federal: Category 2	Global: G1	CDFG: No
State: None	State: S1.1	Audubon:
		CNPS List: 1B
		CNPS RED Code: 3-2-3

Occurrence Number: 1
Quality: Unknown
Type: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: Enterprise (4012253)
County(ies): Shasta
Location: W BANK OF STILLWATER CREEK, ~1/3 MI N OF OLD 44 ROAD.
Lat/Long: 40d 34m 03s / 122d 17m 24s
UTM: Zone-10 N4490778 E560102
Mapping Precision: NON-SPECIFIC (1/5 Mile)
Symbol Type: POINT
Map Index Numbers - Group: 09452
Detail: 09452
--Dates Last Seen--
Element: XXXX/XX/XX
Site: XXXX/XX/XX
Township: 31N
Range: 04W
Section: 02 SW Qt
Meridian: M
Acres: 0
Elevation: 510 ft

Occurrence Number: 2
Quality: Unknown
Type: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: Enterprise (4012253)
County(ies): Shasta
Location: SALMON CREEK BRIDGE, (EAST OF) REDDING ON OLD ALTURAS RD.
Lat/Long: 40d 35m 33s / 122d 17m 39s
UTM: Zone-10 N4493550 E559727
Mapping Precision: NON-SPECIFIC (1/5 Mile)
Symbol Type: POINT
Map Index Numbers - Group: 09443
Detail: 09443
--Dates Last Seen--
Element: 1937/05/19
Site: 1937/05/19
Township: 32N
Range: 04W
Section: 35 NW Qt
Meridian: M
Acres: 0
Elevation: 550 ft

Occurrence Number: 3
Quality: Unknown
Type: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: Enterprise (4012253)
County(ies): Shasta
Location: CLOUGH CREEK AT OLD ALTURAS ROAD.
Lat/Long: 40d 37m 19s / 122d 15m 30s
UTM: Zone-10 N4496843 E562732
Mapping Precision: NON-SPECIFIC (1/5 Mile)
Symbol Type: POINT
Map Index Numbers - Group: 09501
Detail: 09501
--Dates Last Seen--
Element: 1968/05/28
Site: 1968/05/28
Township: 32N
Range: 04W
Section: 24 NE Qt
Meridian: M
Acres: 0
Elevation: 640 ft

California Department of Fish and Game
Natural Diversity Data Base
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Species/Community Location Summary Report

CRYPTANTHA CRINITA
Silky Cryptantha
ID: PDBOR0A0Q0

Occurrence Number: 9
Quality: Unknown
Type: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: Enterprise (4012253)
County(ies): Shasta
Location: (STILLWATER CREEK APPROX 3/4 MI S OF LOOMIS CORNERS).
Lat/Long: 40d 34m 46s / 122d 17m 50s
UTM: Zone-10 N4492099 E559480
Mapping Precision: NON-SPECIFIC (1 Mile)
Symbol Type: POINT
Map Index Numbers - Group: 09429
Detail: 09429

--Dates Last Seen--
Element: XXXX/XX/XX
Site: XXXX/XX/XX

Township: 32N
Range: 04W
Section: 34 SE Qt
Meridian: M
Acres: 0
Elevation:

California Department of Fish and Game
Natural Diversity Data Base
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Species/Community Location Summary Report

ORCUTTIA TENUIS — ID: PMPOA4G050
Slender Orcutt Grass

Status		NDDB Element Ranks		Other Lists	
Federal:	Category 1	Global:	G2	CDFG:	No
State:	Endangered	State:	S2.2	Audubon:	
				CNPS List:	1B
				CNPS RED Code:	2-3-3

Occurrence Number: 1
Quality: Unknown — --Dates Last Seen--
Type: Natural/Native occurrence — Element: 1984/10/09
Presence: Presumed Extant — Site: 1984/10/09
Trend: Decreasing
Quad Summary: Enterprise (4012253), Cottonwood (4012243)
County(ies): Shasta
Location: STILLWATER PLAINS; ABOUT 1.7 MI DUE E OF THE S END OF MAIN RUNWAY OF REDDING MUN AIRPORT.
Lat/Long: 40d 30m 04s / 122d 15m 35s — Township: 31N
UTM: Zone-10 N4483430 E562727 — Range: 04W
Mapping Precision: NON-SPECIFIC (1/5 Mile) — Section: 36 NE Qt
Symbol Type: POINT — Meridian: M
Map Index Numbers - Group: 09491 — Acres: 0
Detail: 09491 — Elevation: 480 ft

Occurrence Number: 2
Quality: Unknown — --Dates Last Seen--
Type: Natural/Native occurrence — Element: 1986/05/25
Presence: Presumed Extant — Site: 1986/05/25
Trend: Decreasing
Quad Summary: Enterprise (4012253)
County(ies): Shasta
Location: 5 MI E OF REDDING, JUST BELOW HWY 44. (1.4 MI E OF ENTERPRISE.)
Lat/Long: 40d 33m 55s / 122d 18m 44s — Township: 31N
UTM: Zone-10 N4490516 E558223 — Range: 04W
Mapping Precision: NON-SPECIFIC (1/5 Mile) — Section: 03 SW Qt
Symbol Type: POINT — Meridian: M
Map Index Numbers - Group: 09388 — Acres: 0
Detail: 09388 — Elevation: 560 ft

ORCUTTIA TENUIS — ID: PMPOA4G050
Slender Orcutt Grass
Occurrence Number: 3
Quality: None — --Dates Last Seen--
Type: Natural/Native occurrence — Element: 1979/XX/XX
Presence: Extirpated — Site: 1984/09/24
Trend: Unknown
Quad Summary: Enterprise (4012253), Cottonwood (4012243)
County(ies): Shasta
Location: REDDING AIRPORT BETWEEN AIRPORT RD & RUNWAYS OF TOWER.
Lat/Long: 40d 30m 09s / 122d 17m 53s — Township: 31N
UTM: Zone-10 N4483557 E559478 — Range: 04W
Mapping Precision: NON-SPECIFIC (1/5 Mile) — Section: 34 NE Qt
Symbol Type: POINT — Meridian: M
Map Index Numbers - Group: 09417 — Acres: 0
Detail: 09417 — Elevation: 480 ft

Occurrence Number: 4
Quality: Unknown — --Dates Last Seen--
Type: Natural/Native occurrence — Element: 1982/06/11
Presence: Presumed Extant — Site: 1984/05/26
Trend: Decreasing
Quad Summary: Enterprise (4012253)
County(ies): Shasta
Location: 5 MI N OF ANDERSON, JUST W OF REDDING MUNICIPAL AIRPORT.
Lat/Long: 40d 30m 39s / 122d 18m 15s — Township: 31N
UTM: Zone-10 N4484478 E558952 — Range: 04W
Mapping Precision: NON-SPECIFIC (1/5 Mile) — Section: 27 SW Qt
Symbol Type: POINT — Meridian: M
Map Index Numbers - Group: 09404 — Acres: 0
Detail: 09404 — Elevation: 500 ft

Occurrence Number: 5
Quality: Unknown — --Dates Last Seen--
Type: Natural/Native occurrence — Element: 1958/08/12
Presence: Presumed Extant — Site: 1984/XX/XX
Trend: Unknown
Quad Summary: Enterprise (4012253)
County(ies): Shasta
Location: ALONG HWY 44 TO MILLVILLE, 5.75 MI E OF REDDING.
Lat/Long: 40d 33m 26s / 122d 17m 28s — Township: 31N
UTM: Zone-10 N4489636 E560017 — Range: 04W
Mapping Precision: NON-SPECIFIC (1 Mile) — Section: 11 NW Qt
Symbol Type: POINT — Meridian: M
Map Index Numbers - Group: 09449 — Acres: 0
Detail: 09449 — Elevation: 450 ft

California Department of Fish and Game
Natural Diversity Data Base
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Species/Community Location Summary Report

ORCUTTIA TENUIS — ID: PMPOA4G050
Slender Orcutt Grass
Occurrence Number: 8
Quality: None
Type: Natural/Native occurrence
Presence: Extirpated
Trend: Unknown
Quad Summary: Cottonwood (4012243), Enterprise (4012253)
County(ies): Shasta
Location: STILLWATER PLAINS, 3.8 MI OF ANDERSON.
Lat/Long: 40d 29m 54s / 122d 17m 55s
UTM: Zone-10 N4483094 E559434
Mapping Precision: NON-SPECIFIC (1/5 Mile)
Symbol Type: POINT
Map Index Numbers - Group: 09416
Detail: 09416

--Dates Last Seen--
Element: 1958/XX/XX
Site: 1982/06/11

Township: 31N
Range: 04W
Section: 34 SE Qt
Meridian: M
Acres: 0
Elevation: 480 ft

Occurrence Number: 29
Quality: Unknown
Type: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: Cottonwood (4012243), Enterprise (4012253)
County(ies): Shasta
Location: ABOUT 0.2 MI E OF S END OF MAIN (N-S) RUNWAY OF REDDING MUNCIPAL AIRPORT.
Lat/Long: 40d 29m 59s / 122d 17m 22s
UTM: Zone-10 N4483255 E560210
Mapping Precision: NON-SPECIFIC (1/5 Mile)
Symbol Type: POINT
Map Index Numbers - Group: 09444
Detail: 09444

--Dates Last Seen--
Element: 1984/09/24
Site: 1984/09/24

Township: 31N
Range: 04W
Section: 35 NW Qt
Meridian: M
Acres: 0
Elevation: 480 ft

California Department of Fish and Game
Natural Diversity Data Base
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Species/Community Location Summary Report

.YPTANTHA CRINITA ID: PDBOR0A0Q0
Silky Cryptantha

---------Status---------	NDDB Element Ranks	-------Other Lists-------
Federal: Category 2	Global: G1	CDFG: No
State: None	State: S1.1	Audubon:
		CNPS List: 1B
		CNPS RED Code: 3-2-3

Occurrence Number: 4
Quality: Unknown --Dates Last Seen--
Type: Natural/Native occurrence Element: 1940/05/01
Presence: Presumed Extant Site: 1940/05/01
Trend: Unknown
Quad Summary: Hooker (4012233), Cottonwood (4012243)
County(ies): Shasta, Tehama
Location: 1 MI S OF COTTONWOOD, ALONG U.S. HWY #99.
Lat/Long: 40d 21m 52s / 122d 17m 02s Township: 29N
UTM: Zone-10 N4468243 E560802 Range: 04W
Mapping Precision: NON-SPECIFIC (1 Mile) Section: 14 SW Qt
Symbol Type: POINT Meridian: M
Map Index Numbers - Group: 09442 Acres: 0
Detail: 09442 Elevation: 420 ft

Occurrence Number: 11
Quality: Unknown --Dates Last Seen--
Type: Natural/Native occurrence Element: XXXX/XX/XX
Presence: Presumed Extant Site: XXXX/XX/XX
Trend: Unknown
Quad Summary: Bend (4012232), Hooker (4012233), Balls Ferry (4012242), Cottonwood (4012243)
County(ies): Tehama
Location: COTTONWOOD CANAL, NEAR COTTONWOOD-ELVERTA #3 TRANSMISSION LINE.
Lat/Long: 40d 22m 04s / 122d 14m 34s Township: 29N
UTM: Zone-10 N4468642 E564290 Range: 03W
Mapping Precision: NON-SPECIFIC (1 Mile) Section: 18 XX Qt
Symbol Type: POINT Meridian: M
Map Index Numbers - Group: 09507 Acres: 0
Detail: 09507 Elevation: 450 ft

California Department of Fish and Game
Natural Diversity Data Base
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Species/Community Location Summary Report

CRYPTANTHA CRINITA — ID: PDBOR0A0Q0
Silky Cryptantha
Occurrence Number: 12
Quality: Unknown
Type: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: Red Bluff West (4012223), Hooker (4012233)
County(ies): Tehama
Location: ALONG BLUE TENT CR, -4 MI SE OF JCT OF HOOKER RD & HOOKER CRRD ON HOOKER RD NW OF REDBLUFF
Lat/Long: 40d 26m 24s / 122d 18m 36s
UTM: Zone-10 N4476616 E558509
Mapping Precision: NON-SPECIFIC (1/5 Mile)
Symbol Type: POINT
Map Index Numbers - Group: 09375
Detail: 09375

--Dates Last Seen--
Element: 1986/05/04
Site: 1986/05/04

Township: 28N
Range: 04W
Section: 27 SW Qt
Meridian: M
Acres: 0
Elevation: 450 ft

California Department of Fish and Game
Natural Diversity Data Base
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Species/Community Location Summary Report

ALIAEETUS LEUCOCEPHALUS ID: ABNKC10010
Bald Eagle

---------Status--------	NDDB Element Ranks	-------Other Lists-------
Federal: Endangered	Global: G3	CDFG: No
State: Endangered	State: S3	Audubon:
		CNPS List:
		CNPS RED Code:

Occurrence Number: 13
Quality: Good
Type: Natural/Native occurrence
Presence: Presumed Extant
Trend: Stable
Quad Summary: Igo (4012255)
County(ies): Shasta
Location: DOG GULCH; JUST WEST OF WHISKEYTOWN DAM, WHISKEYTOWN RESERVOIR.
Lat/Long: 40d 35m 45s / 122d 33m 10s
UTM: Zone-10 N4493777 E537841
Mapping Precision: NON-SPECIFIC (1 Mile)
Symbol Type: POINT
Map Index Numbers - Group: 08882
Detail: 08882

--Dates Last Seen--
Element: 1990/XX/XX
Site: 1990/XX/XX

Township: 32N
Range: 06W
Section: 28 SW Qt
Meridian: M
Acres: 0
Elevation: 1300 ft

IGO QUAD
Date of Report: 10/28/93
Government/Conservation Client
Information expired on 08/01/93

California Department of Fish and Game
Natural Diversity Data Base
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Species/Community Location Summary Report

JNCUS LEIOSPERMUS VAR LEIOSPERMUS ID: PMJUN011L2
Red Bluff Dwarf Rush

---------Status---------	NDDB Element Ranks	-------Other Lists-------
Federal: Category 3C	Global: G2T2	CDFG: No
State: None	State: S2.2	Audubon:
		CNPS List: 1B
		CNPS RED Code: 3-2-3

Occurrence Number: 14
Quality: Unknown --Dates Last Seen--
Type: Natural/Native occurrence Element: 1979/04/25
Presence: Presumed Extant Site: 1979/04/25
Trend: Unknown
Quad Summary: Mitchell Gulch (4012234), Blossom (4012224)
County(ies): Tehama
Location: 16 MILES W (NW) OF RED BLUFF (HWY 36).
Lat/Long: 40d 15m 17s / 122d 27m 53s Township: 28N
UTM: Zone-10 N4455956 E545522 Range: 05W
Mapping Precision: NON-SPECIFIC (1 Mile) Section: 30 NE Qt
Symbol Type: POINT Meridian: M
Map Index Numbers - Group: 09017 Acres: 0
Detail: 09017 Elevation: 760 ft

Other Elements to Look for on OLINDA Quad

RANA AURORA DRAYTONI AAABH01022
CALIFORNIA RED-LEGGED FROG
Federal Staus: Category 2 Global Rank: G4T2T3
State Status.: None State Rank: S2S3
Habitat Associations----------
General.: Not available at this time.
Micro...: Not available at this time.
Location..: REDDING.
Source....: STEBBINS, R. 1951 (LIT)
Last Seen.: XXXX-XX-XX

ANTIRRHINUM SUBCORDATUM PDSCR040B0
DIMORPHIC SNAPDRAGON 1
Federal Staus: Category 3C Global Rank: G2
State Status.: None State Rank: S2.2
Habitat Associations----------
General.: CHAPARRAL
Micro...: ULTRAMAFIC
Location..: NEAR ROSEWOOD, STIVARS RANCH.
Source....: JEPSON, W.L. #21, 303 JEP (HERB)
Last Seen.: 1899-04-25

JUNCUS LEIOSPERMUS VAR LEIOSPERMUS PMJUN011L2
RED BLUFF DWARF RUSH 2
Federal Staus: Category 3C Global Rank: G2T2
State Status.: None State Rank: S2.2
Habitat Associations----------
General.: Not available at this time.
Micro...: Not available at this time.
Location..: 4 MI E OF REDDING.
Source....: ERTTER, B. 1980 (PERS)
Last Seen.: 1937-05-19

California Department of Fish and Game
Natural Diversity Data Base
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Species/Community Location Summary Report

KEAT VALLEY COTTONWOOD RIPARIAN FOREST ID: CTT61410CA
Great Valley Cottonwood Riparian Forest

---------Status--------	NDDB Element Ranks	-------Other Lists-------
Federal: None	Global: G2	CDFG: No
State: None	State: S2.1	Audubon:
		CNPS List:
		CNPS RED Code:

Occurrence Number: 21
Quality: Good --Dates Last Seen--
Type: Natural/Native occurrence Element: 1985/08/02
Presence: Presumed Extant Site: 1985/08/02
Trend: Unknown
Quad Summary: Enterprise (4012253), Redding (4012254)
County(ies): Shasta
Location: UPSTREAM OF HWY 44-299 BRIDGE OVER SACRAMENTO RIVER, ON WEST(S) BANK, REDDING.
Lat/Long: 40d 35m 25s / 122d 22m 21s Township: 32N
UTM: Zone-10 N4493255 E553091 Range: 05W
Mapping Precision: SPECIFIC (0 Mile) Section: 36 NE Qt
Symbol Type: POLYGON Meridian: M
Map Index Numbers - Group: 09288 Acres: 109.8
Detail: 09288 Elevation: 480 ft

A:\WP\RECBRDKD.WP6

December 5, 1997

DRAFT

1993-94 CLEAR CREEK FISHERY HABITAT RESTORATION PROJECT

During 1993 and 1994, DWR under contract to DFG, designed the Clear Creek Fishery Habitat Restoration Project. The purpose was to prepare a project to create a sediment control basin at Saeltzer Reservoir, and to increase spawning habitat and improve channel conditions at sites downstream from the dam. All regulatory agency permits and environmental documents were to be acquired.

The following provides information on the status of that project.

Environmental Document

An Initial Study and Negative Declaration was prepared and sent for review to the State Clearing House. This was for a site specific project to remove up to 15,000 cubic yards of sediment from above Saeltzer Dam, and to place spawning gravel and do low flow channel modifications below the dam.

The Clearing House assigned Number 93122013 to the project. The document was reviewed by regulatory agencies, and comments received. As the final step in the environmental process, A Notice of Determination was sent to the Clearing House It was returned, unprocessed. A new law required payment of a $1250 Environmental Filing Fee to DFG before the notice could be filed. Since the DFG contract amount was exceeded, we tried to get DFG to provide a wavier of the fee with no success. We then requested that DFG allow us to bill them under our contract for the added amount of $1250. This also was refused.

A year or so later, this fee was eliminated. We asked Phil Warner, our DFG contract coordinator if we should send in the Notice of Determination to complete the environmental process. He conferred with Harry Rectinwald, who apparently decided, since the federal government was probably going to acquire the downstream properties, the project would change, so we should not bother.

The result is there is no approved environmental document for the dredging work. I assume that for any work to be accomplished, the environmental process must begin from scratch, unless the Notice of Determination can be submitted now. If so, then we could probably "supplement" the document to cover any site specific changes.

Reclamation Board Permit.

The Reclamation Board has jurisdiction for flood control on Clear Creek from the

Sacramento River to Whiskeytown Dam. Any work in the flood channel requires a Permit. Permit Number 16179 was issued to the Department of Water Resources on September 1, 1994. It will remain in effect until revoked by the Board. Non-compliance with terms of the permit are grounds for revoking.

Permit 16179 is site specific to place spawning gravel and modify the low flow channel at several locations downstream from Saeltzer Dam. It also allows removal of up to 15,000 cubic yards of sediment from above the dam to create a sediment control basin.

Any changes to the project as originally described in the permit application will require advance submittal of drawings and specifications for Board approval. The original permit required well over 6 months to be issued.

State Lands Commission Permit and Easement.

The State of California holds sovereign ownership of submerged lands and beds of navigable waterways. These lands are under the jurisdiction of the State Lands Commission. In a letter to John M. Elko dated May 27, 1994, (File Reference SD 94-02-04.4), the Commission acknowledges probable jurisdiction between the ordinary high water marks in Clear Creek. However, due to staff and funding limitations, they had not initiated a study of the area to define the extent of the State's interest.

The letter said the Commission would require no lease, permit or easement at that time. However, the right to require such documents in the future was reserved if the Commission determines the project occupies State property. The response took 5 months.

Shasta County and the State Mining and Geology Board.

A letter of notification to Shasta County Department of Public Works did not receive a response. However, the County Planning Division, after review of the USCE permit announcement believed that the dredging project qualifies under the Surface Mining and Reclamation Act (SMARA) and will require a Reclamation Plan. Not only will the plan require deciding where and how spoil is placed, it will also require a comment to long term monitoring and maintenance. The reason for the county concern is the possibility spoil material may be disposed of at commercial screening plants. If the spoil could be deposited on the same parcel, then this would not be a mining project, and no reclamation plan would be required. Otherwise, the county thinks this is a mining project.

An attempt to get an exemption from the State Mining and Geology Board was not successful. No reclamation plan was developed, since the actual disposal site was not known. There is a possibility spoil will be placed on public or private dredger tailings for wild life habitat. But any dredging project will probably require filing this plan.

An additional development: In the September, 1996 newsletter of the California Central Valley Flood Control Association, the Association said it opposed the SM&GB policies that construction, cleaning and maintenance of flood control channel and facilities come under SMARA. They proposed to the Board that an exemption should be established that covers flood control construction, deepening or expansion, including natural channels. Before we are committed to a Reclamation Plan, along with the requirement of long term maintenance and monitoring, the status of this exemption proposal should be investigated.

US Army Corps of Engineers

Permit Number 199300761 was issued to the Department of Fish and Game on August 9, 1994. This permitted dredging up to 15,000 cubic yards of sand, silt and gravel from the Saeltzer Reservoir. Temporary access ramps could be constructed in the reservoir. Material removed could be hauled to screening plants for gravel recovery. The Corps placed a 3 year time limit (to August 31, 1997), but it could be extended upon an application at least one month before expiration. If the work was done under the auspices of DFG, other agencies could operate under the permit.

Since the permit has not been extended, it is probably void. However, it could be included as reference material in a new application. The Corps' special format for the drawings are available on AutoCAD, and could be easily modified for design changes. The original permit process took about 8 months to complete.

Federal Emergency Management Agency

We sent FEMA a notification letter describing the project, and including USCE permit drawings. We evaluated gravel placement work in relation to the total floodway cross section. The conclusion was the placement would reduce the area by about 0.6%, and increase maximum flood levels by about 0.01 foot. We did not evaluate flood levels at the dredging site.

To date, we have not received a response from FEMA. For future projects we should send them another notification letter.

Water Quality Control Board

The Redding Regional WQCB sent us a letter dated January 24, 1994 waiving the waste discharge requirements and certification under Section 401 of the Clean Water Act. The letter specified no discharging of waste material or soils. Project activity could not increase turbidity more than 20% above background levels, except during working hours, when turbidity could not increase to greater than 20 FTU. It also specified a monitoring and reporting schedule.

There was no expiration date on the letter. The reply took about a month to process.

Division of Safety of Dams.

The DWR Division of Safety of Dams, in a letter dated December 20, 1993, stated Saeltzer Dam was inspected in 1977 and found not to qualify for State jurisdiction, being 15 feet high, and having a reservoir capacity of 5 acre feet. Safety of Dams said excavation of 10,000 yards of upstream sediment would increase the volume to 11 acre feet, still below the jurisdictional volume of 50 acre feet for dams below 25 feet in height.

If plans are to dredge the reservoir, then remove the dam, we should confer with them again.

State of California
The Resource Agency
Department of Water Resources

NEGATIVE DECLARATION
AND
INITIAL STUDY
FOR THE
CLEAR CREEK FISHERY HABITAT
RESTORATION PROJECT

STATE CLEARING HOUSE
NUMBER 93122013

(TITLE PAGE ONLY)

APRIL 1994

Appendix B

Organizations Consulted

California Department of Fish and Game

California Department of Water Resources

State Reclamation Board

Central Valley Regional Water Quality Control Board

County of Shasta Planning Department

Western Shasta Resource Conservation District

U. S. Fish and Wildlife Service

National Marine Fisheries Service

U. S. Army Corps. of Engineers

U.S. Bureau of Reclamation

U.S. Bureau of Land Management

U.S. Natural Resource Conservation Service

U.S. Geological Survey

Scoping Team Member List

Jim DeStaso, Fishery Biologist, BOR

Harry Rectenwald, Environmental Specialist IV, DFG

Paul Ward, Associate Fishery Biologist, DFG

Phil Warner, Fisheries Habitat Supervisor IV, DFG

Bill Mendenhall, Senior Engineer, DWR

Kevin Dossey, Associate Engineer, DWR

Matt Brown, Fishery Biologist, USFWS

Steve Borchard, Soil Scientist, BLM

Jeff Souza, Range Management, WSRCD

Bob Bailey, Range Management, NRCS

Norman Braithwaite, Consulting Engineer for TFWDC

Additional Technical Support

George Heise, Hydraulic Engineer, DFG

Don Rasmussen, Senior Engineer, DWR

Mike Inamine, Senior Engineer, DWR

Christina Acken, Engineer, DWR

Robert Lotz, Cost Estimator, DWR

William C. Lane, Technician I, DWR

Kelly Staton, Fish and Wildlife Scientific Aid, DWR

Mark Souverville, Student Assistant, DWR

Jeff Van Gilder, Graduate Student, DWR

Koll Buer, Senior Engineering Geologist, DWR

Appendix C

Meeting Notes, Memos and Correspondence

Date: November 7, 1996

Subject: Fish Passage Issues for Saeltzer Dam on Clear Creek near Redding, Ca.

Alternatives

1. Remove dam
   A. Buy out water right
   B. Change point/type of diversion headworks (ditch upstream)
2. Remodel existing ladder
   A. Remodel tunnel
   B. Remove top from tunnel and rebuilt ladder
3. Build new ladder at dam and possibly enhance gorge passage
   A. Build a ladder through dam near to south end.
   B. Build a ladder along old ladder alignment at upper end and turn it to end at base of dam.

Harry 4. A. Modify Dam with Flashboards

Passage Needs

1. Design for Salmon (Spring and/or fall) and/or steelhead?
2. Time of passage?
3. Do we need to be able to control passage? (Open and close)
4. What is going to be base flow release for Clear Creek from Whisteytown Dam?
5. Is gorge a passage problem? If so, at what flow range?

Stakeholders

Who will be part of the scoping committee?

Schedule

Funding

Preliminary engineering/environmental/permitting funds are approximately $150,000.

By: Bill Mendenhall

Filename: NOTES57.97

Date: May 7, 1997

Subject: Notes from May 7, 1997, Clear Creek - Saeltzer Dam Fish Passage Project Meeting at the WSRCD office in Redding

Attendees: BOR - Jim DeStaso
DFG - Harry Rectenwald, Paul Ward, Phil Warner
DWR - Bill Mendenhall, Kevin Dossey, Glyn Echols
USFWS - Matt Brown
WSRCD - Jeff Souza
NRCS - Bob Bailey, Tim Viel, Mark Cooke, Vern Finney
USGS - Lee Price
BLM - Steve Borchard

See attached "Clear Creek Meeting Summary - May 7, 1997" by Jim DeStaso.

Saeltzer Dam is owned by Townsend Flat Mutual Water Company.

Water right - 55 cfs (Pre-1914)
McConnell Trust owns 85% share of water right.

DFG owns land on which the dam sits on.
A 1935 description of dam exists somewhere.
300 acre pasture is use area (small for big dam).
Not effective passage at dam.
Gorge below dam is tough on fish too.

Harry said: Alternatives 1 and 2 (attached list) are least feasible because of 1) historic dam and 2) pre-1914 water rights.

15% shareholder (Ward family) wants $1 million for water right.
DWR should report on 3 or 4 alternatives.
Gorge must be worked on. Widen and even out slope. Blasting is not good because of potential damage to dam. Need Geo-tech work.

* Need cost estimate of doing integrity study
* Do Survey of Gorge
* Take core samples. 100' of cores @ $15,000
* Need cost estimate of replacing dam in place.

Saeltzer Dam Passage Alternatives (BOR)

* **Alternative 1 - Dam removal, eliminate water right**

* **Alternative 2 - Dam removal, alternate water supply** low head

* **Alternative 3 - Dam removal, construct upstream diversion with pipe connecting to Townsend Irrigation District (TID) Canal headworks.**

Alternative 4 - Improve existing ladder, TID retains water right

Alternative 5 - Construct new fish ladder, TID retains water right

Alternative 6 - Remove all or part of dam, install bladder dam, TID retains water right

Alternative 7 - Remove all or part of dam, install flashboards, TID retains water right

All above alternatives include widening the gorge below Saeltzer Dam and some level of dredging Saeltzer Reservoir.

Several engineers (BOR and CH2M Hill) have serious concerns regarding structural integrity of Saeltzer Dam. They suggested great caution before conducting any activity around the dam. This included dredging Saeltzer Reservoir, widening the gorge, and construction of a fish ladder around the south abutment. In their professional opinions they felt that either of these activities may cause dam failure or decrease already questionable stability. Activities in close proximity to the dam may require reenforcing the dam's integrity. They suggested an integrity study be conducted before any activity is initiated. They also cautioned that it may be premature to conduct an integrity study before it is know what activities will occur since the nature of the integrity study will vary depending on activity.

	Passage Alternatives						
Desired Criteria	1	2	3	4	5	6	7
Performs the function							
Reliability							
First cost is low							
Operations cost							
Ease of maintenance, repair, and replacement							

Desired Criteria	Passage Alternatives						
	1	2	3	4	5	6	7
Simplicity to construct or assemble							
Biologically desirable							
Feasibility (fiscally, politically)							
Total							
Rank							

Excellent-5 Very good-4 Good-3 Fair-2 Poor-1

If the dam is left in place, options are:

- Tunnel (modify inside)
- New Ladder:
  - In dam
  -Through new section
  - Through old section
  - Around south end

- Modify existing ladder complex.

Structural integrity - How much reinforcement is needed?
Paul says no Prop. 204 $ if we must be indemnifiable for future dam damage.

Gravel transport is important. Do dredging.

There was an old dam upstream (no records).
6-½ mile 1500' wide Digital Terrain Survey was flown on 3/21/97. +14 cross sections were surveyed.
Q ~ 250 cfs
"Enplan" was contractor.

New Dam
Dam removal - would need to predict what it would do to geomorphology in area.
Could do backhoe test holes near "wedge" of sediment.

Consider fish screen. BLM requirements, O & M.

Other sources of water. Look into improving conveyance, ground water, water exchange, ACID water trade.
Call on water right losses.
Could move fish upstream for 3 years if passage is provided within 3 years
(This could buy time for water right transfers.)

Clear Creek Meeting Summary - May 7, 1997 (BY Jim DeStaso)

- Group expressed concern with structural integrity of Saeltzer Dam and this concern has been confirmed by several engineers. This uncertainty will likely raise liability issues related to future construction activity impacts on Saeltzer Dam. Structural integrity investigations are required for any project near the dam with the level of investigation dependant on the type of activity.

- Group agreed that passage is a compound problem: bedrock gorge below Saeltzer Dam and Saeltzer dam itself. Passage improvement through the gorge is included with all passage improvement options

Components of DWR Passage Feasibility Study:

1. Survey bedrock gorge below Saeltzer Dam and cost estimate for gorge enlargement.
   Group agreed that survey should be moderately detailed providing enough resolution to compared pre- and post-gorge enlargement configuration.

2. Cursory Saeltzer Dam integrity investigation.
   Approximately three cores, total 100 feet, will be taken from Saeltzer Dam. Cores will provide information on dam construction material and methods, and provide insights into dam integrity.

3. Examine three basic fish passage options with Saeltzer Dam remaining in its current form. Cost of dam replacement (in case of dam failure/damage during construction), dredging requirements, indemnification for potential dam failures, and work required to possibly structural integrity strengthening allowing construction activity will all be addressed. Potential for each suboption to provide bedload transport will be examined.
   a. Construction of a new ladder around the south abutment of Saeltzer Dam.
   b. Modification of existing ladder complex (tunnel and ladder).
   c. New ladder constructed/incised into Saeltzer Dam.

4. Abandon present dam site for a dam approximately one third as tall at a site a short distance upstream. Remove present dam and dredge reservoir in accordance with historic preservation requirements. The need for a low ladder at the old dam site will be examined. New dam will include a ladder, screen, pipeline to existing canal headwork, removeable sections for gravel transport or removing the dam in case of water right exchange/transaction.

5. Complete removal of Saeltzer Dam and cursory examination of alternate water supplies (e.g. groundwater, ACID, Bella Vista) including purchase of TMWC water rights.

6. Draft preparation of environmental documents for preferred alternative.

- Coordinate alternative with TMWD, property holder(s), and agencies.

- DWR will produce a bulleted outline by mid-July, 1997.

- Assemble technical team to examine seeding of blocked habitat with spring-run chinook salmon and steelhead prior improving passage problem.

- Reclamation will pursue possible water trade/transfer of TMWD water right.

Filename: NOTES77.97

Date: July 7, 1997

Subject: Notes from July 7, 1997, Clear Creek – Saeltzer Dam Fish passage Project Meeting at the DWR office in Red Bluff

Attendees: DFG – Paul Ward, Harry Rectenwald
DWR – Kevin Dossey, Bill Mendenhall

Harry said:
TFWDC has asked Norman Braithwaite, a consulting engineer, to prepare a CalFed proposal for an upstream dam site. North State Resources will do the environmental documents for project.

Bill and Paul expressed concerns about submitting a CalFed proposal prior to completion of the DWR study and evaluation of alternatives, and group/agency concensus on which alternative is best.

Harry:
TFWDC Attorney, Jeff Swanson, said no way will TFWDC relinquish water right.

3 alternatives, now 2.

Mr. Braithwaite will prepare a 6 page proposal by 28th of July.
Dredge sediment, remove dam, build low head dam, ditch on right bank, pipe across to screen and ditch.

Benefits of an upstream dam site:
- Recovery pool
- Less head
- No catastrophic sediment release

DWR should re-write task to focus on the 1 alternative, the upstream dam site.

Is Saeltzer Dam a Historic Dam ?

RCD or County or DFG will need to be lead in CEQA documents.

DFG wants to sell property at existing dam site to BLM.

Jeff Swanson is water right attorney for the McConnell Foundation. He contacted Braithwaite about engineering a project and preparing the Cal Fed proposal. Ward family also has an attorney.

Photogrammetric Survey has been done – call the WSRCD 246-5299.

July 14, 1997

Saeltzer Dam Fish Passage Project

Status of Fish Passage Alternatives as of July 14, 1997

The following is a list of the alternatives that have been considered by the Clear Creek Restoration Program coordination group as possible solutions to the fish passage problem at Saeltzer Dam. The reasons for eliminating alternatives are given, some of the pros and cons of the remaining alternatives are discussed, and DWR's plan is laid out. Also, an addendum resulting from a July 18, 1997 meeting, is attached.

List of Alternatives

Alternative 1: Do nothing.

Alternative 2: Remove dam and buy Townsend Flat Water Ditch Company's (TFWDC) Clear Creek surface water right. (Could be bought by CDFG, CVP, SWP or others.)

Alternative 3: Remove dam and provide TFWDC with an alternate water supply in exchange for their Clear Creek surface water right. (Alternate supplies could be local groundwater and/or surface water purchased from other water districts.)

Alternative 4: Remove dam and construct a low head (about 4' versus the existing 15') diversion dam approximately 2000' upstream of the existing dam. Also construct a canal and/or pipeline to the existing headworks structure. A new fishway and screen would also be built at the new diversion dam site.

Alternative 5: Remove all or part of the dam and install a bladder dam for use when diverting water.

Alternative 6: Remove all or part of the dam, construct a flashboard stanchion system, and install flashboards when diverting water.

Alternative 7: Remove dam and reconstruct a new dam at the same location with a fishway through the new dam.

Alternative 8: Improve the existing fish ladder and tunnel.

Alternative 9: Construct a new fishway through the existing dam.

Alternative 10: Construct a new fishway around the south side of the existing dam.

Note: All of the alternatives except alternative 1 include potentially modifying the gorge below the dam to improve fish passage.

Reasons for Eliminating Alternatives

Of the 10 alternatives considered, only alternatives 4, 7 and 10 remain as viable solutions to the fish passage problem. The other alternatives have been eliminated for the following reasons:

Some of the alternatives have common underlying factors that make them less desirable than the other options. The alternatives for TFWDC to sell or exchange their water rights have been considered potential long term solutions that are solely the decision of TFWDC. Alternatives involving partial removal of the dam aren't very practical because TFWDC has the right to divert water all year, and the operation and maintenance requirements for raising and lowering part of the dam is something they probably won't accept and because of the questionable structural integrity of the dam. Any modifications that involve the existing dam would likely result in the need to rebuild the entire structure.

More specific reasons for eliminating some of the alternatives are as follows:

Alternative 1 is not being considered by the coordination group because it is not a solution to the fish passage problem.

Alternatives 2 and 3 have been eliminated as TFWDC indicated that there is no chance of TFWDC selling or exchanging their water rights in the near future. Also, eliminating the diversion of water through the ditch would undoubtedly result in numerous protests because of the potential negative impacts on the surrounding groundwater table and riparian habitat and vegetation near the ditch.

Alternatives 5, 6 and 9 were eliminated after an inspection of the dam by Frank Glick, Supervising Engineering Geologist, DWR Division of Engineering, confirmed what had been observed by some of the coordination group and engineers from BOR and CH2M Hill; the structural integrity of the dam is questionable. Frank believes construction activities involving cutting through the dam could increase leakage through the dam and possibly cause dam failure because of the poor physical condition of the dam. However, he also believes that construction activities close to the dam, including controlled blasting, could be performed without damaging the dam. Refer to the Geologic Inspection memo for more details.

Alternative 8 was eliminated because the existing tunnel/ladder is not large enough to carry the flows needed for spring run chinook passage and the cost of enlarging the tunnel/ladder might be prohibitive.

July 14, 1997

Pros and Cons of Alternatives 4, 7 and 10

The following is a partial list of the pros and cons associated with the 3 remaining viable fish passage solutions. Surely there are more factors to consider than the ones listed, and more will arise before an alternative is selected.

Alternative 4 (Remove dam, construct low head dam upstream)

Pros:

- This alternative provides the best fish passage solution as the fish will have a chance to rest after making the journey through the gorge, and the new lower dam would be less of an obstacle to the tired fish.
- DFG owns the land on which the existing dam lies and wants to sell or trade the land to BLM. BLM indicated they won't make the deal if the existing dam remains in place. So dam removal helps DFG accomplish a goal.
- If the DFG/BLM land deal gets derailed, even with the dam removed, DFG and TFWDC liability will probably decrease with a lower dam upstream.

Cons:

- This is a relatively expensive alternative.
- Owner operation and maintenance requirements will increase because of the extended ditch and/or pipe.
- A new fish screen should be constructed at the upstream dam site, requiring additional O & M.
- Owner liability could increase if a pipe is placed across the creek to carry the diverted water from a ditch on the south side of the creek, as the TFWDC engineer has proposed.
- A ditch or pipeline originating closer to the stream level may be more susceptible to damage by flood flows and have problems with sediment transport.
- Moving the point of diversion upstream may require additional legal work.
- Removal of the dam may have consequences associated with the National Historical Preservation Act.

Alternative 7 (Remove dam, reconstruct dam in same location with new fishway)

Pros:

- This alternative provides a good fish passage solution as the fishway can be tailored to fit the site.
- TFWDC would get a new dam without having to change the point of diversion and potentially increasing O & M requirements.
- The liability associated with potential dam failure would be decreased with the construction of a new dam.

Cons:

- This is a relatively expensive alternative.
- Removal of the dam may have consequences associated with the National

Historical Preservation Act.

- DFG owns the land on which the existing dam lies and wants to sell or trade the land to BLM. BLM indicated they won't make the deal if the existing dam remains in place. (This matter may not be issue if BLM is comfortable with a new dam.)

Alternative 10 (New fishway around south side of dam)

Pros:

- This is the least expensive alternative.
- This alternative provides a good fish passage solution.

Cons:

- DFG owns the land on which the existing dam lies and wants to sell or trade the land to BLM. BLM indicated they won't make the deal if the existing dam remains in place.
- The potential liability associated with the existing dam would remain with both DFG and TFWDC.

The selected alternative will potentially include work to improve fish passage through the steep gorge that begins about 130' downstream of the dam and drops about 25' in elevation over the next 200'. The work would include blasting of large boulders and rock configurations that are impeding fish passage. The work could be included in the same contract that will cover the work at the dam and/or upstream. However, the blasting may be done by DFG staff, separate from the contract work, but during the same time period. DWR will perform a cursory survey of the gorge to document the existing condition. At this time, DWR is not being directed to produce plans for blasting, but will offer assistance as needed.

DWR Work Plan

DWR has begun site surveying and will compare elevations with the orthophotographic contour maps produced by Enplan Mapping Contractor of Redding. If there is good correlation between the two sets of data, then the DWR site surveying could be reduced and the focus of work could proceed sooner to preliminary designs and cost estimates. After an alternative is selected and agreed upon by the group and TFWDC, the Initial Study by DWR environmental specialists can begin. If alternative 7 or 10 is selected, no core drilling will be necessary. However, if alternative 4 is selected, DWR will perform reconnaissance work at the proposed upstream dam site. The work could include exploration with a backhoe to determine the depth of alluvium at the site and possibly drilling core samples from the underlying bedrock. Then the engineering Feasibility Report, which will be instrumental in obtaining construction funding, will be completed by September 30, 1997. This should allowing ample time for the owners to

apply for funding for final design, permits and construction so the project can be completed in the summer of 1998. If core drilling is performed at the site, the final Foundation Geology Report may not be completed until after September 30, 1997. Also, the final environmental Draft Initial Study may not be completed by then. But finishing these documents after completion of the engineering Feasibility Report shouldn't delay the RFP process. Draft forms of the two documents may be available for review by September 30,1997 and will be finalized in time to be incorporated in final design work.

Addendum to "Status of Fish Passage Alternatives as of July 14,1997"

DWR was recently informed that TFWDC hired Norman Braithwaite, a private engineer, to design a project similar to Alternative 4, provide a project cost estimate, and apply for CalFed Category III funding by July 28,1997. It may be premature to seek funding for construction since a firm cost estimate is not possible without completimg site surveys and investigating some of the issues that may add to the project costs. So an option that TFWDC may want to consider for the July 28 round of Category III funding is to apply for funds to pay for final designs and preparation of an RFP which would seek firm bids for construction of the project. Then TFWDC could apply for construction funding at a later date.

A meeting was held on July 18, 1997 with Bill Mendenhall and Kevin Dossey, DWR, Paul Ward and Harry Rectenwald, DFG, and Norman Braithwaite present to discuss some issues and concerns about the project and determine how DWR and Braithwaite could best work together in completing designs and pursuing funding.

It was decided that DWR will continue with the engineering Feasibility Report and environmental Initial Study with emphasis on Alternative 4 (assuming the restoration group agrees to support this alternative) and addressing the two other alternatives that could be implemented if a project stopping roadblock is encountered during the Alternative 4 final design phase. Also, a Foundation Geology Report will be prepared after exploring soil conditions at the upstream dam site. DWR will continue with the survey of the gorge area and may survey the upstream dam site prior to the final design phase. The orthophoto contours produced by Enplan are sufficient for the preliminary design and cost estimate for Alternative 4.

TFWDC intends to submit the proposal for Category III funding for final engineering and construction, broken down into two separate components, by the July 28, 1997 deadline.

Some of the other issues addressed at the meeting, and which will be discussed at the July 22,1997 restoration group meeting, include:

- site access
- land ownership
- owner operation and maintenance
- open ditch versus pipe
- pipe across creek versus a siphon
- new fish screen
- changing the point of diversion
- lead agency (Shasta County?)
- photo documentation of dam

Filename: NOTES714.97

Date: July 14, 1997

Subject: Notes from July 14, 1997, Clear Creek – Saeltzer Dam Fish Passage Project at the DWR office in Red Bluff

Attendees: DFG - Paul Ward, Randy Benthin, Harry Rectenwald
DWR - Kevin Dossey, Bill Mendenhall
BOR - Jim DeStaso

Harry spoke with Braithwaite - No project-killing problem yet with alternative 4. $360,000 from DFG for 6 sites: 3 on Butte Creek, 1 on Battle Creek, 1 on Clear Creek, 1 on Yuba River. Money to be spent by October 1, 1997.

Harry and Jim didn't realize 6 projects would be prioritized.

CAT III RFP can be:
1) Fairly well designed – Apply for money as packaged Final Design and Construction Project.
2) Conceptual design -Apply for total amount of money, get draws for Design, then Construction after 3 bids.

Harry said: Norm's estimate - $100,00 for ditch and "siphons" along south bank.
TFWDC will apply for 1) to CalFed.

Norman Braithwaite estimated $1,200,00 for Alternative 4.

TFWDC desires a partnership project (private/public).

TFWDC was clear on issue that O&M cost is theirs.

About 2400 RFP's have been submitted to CalFed so far.
Francis ?: Overhead pipe better than dam; siphon better than pipe.

Project would include:
- Remove old dam
- Gorge enlargement
- New dam and conveyance system

CEQA requires alternatives.

Alternative 4 - Low O&M dam.
Alternative 10 or 7 - Two land-owners & diverters oppose.
Access, ownership, easements need to be considered.

To: Bill Mendenhall/Paul Ward 7/15/97
From: Hamp Rectenwald

Briefing on Alternative Analysis for Sealtzer Dam Passage Problem

1) Removal of all Surface Water Diversion Rights from Creek:

- Not Feasible due to Property Owner's rejection.
- Loss of conjunctive use for instream flow for fisheries and temperature uses.

2) Remove and Reconstruct Sealtzer Dam With Ladder::

- Poor Passage Performance expected relative to upstream dam. Poor perfomance at existing site (including downstream gorge) demonstrated with two past failures at passage facilities.
- Land owners - both current (DFG) and future (BLM) reject having a tall dam.
- Dam construction costs and time expected to exceed upstream site due to uninterupted service requiring upstream diversion and intense civil engineering requirements for a tall gravity or arch dam with multi-flow ladder.

3) Remove and Reconstruct Sealtzer Dam at Upstream Site:

- Site should have improved passage performance over existing site becasue upstream dam and dike will be one-third to one-quarter the height with large recovery area above the gorge to limit fall-back rate of adults and better survival of downstream migrant juveniles..
- The site should provide ancillary benefits better than existing dam, including passing fish gravel bedload, accomodating an improved screen and facilitating sand trap operations all due to favorable location and dam configuration.
- The project should be completed in one construction season instead of two.
- The project will require either an overhead pipe (or recreational trail bridge) or siphon increasing cost or liability; but not expected to exceed that of a tall dam.
- Project acceptable to new landowner - BLM.

Project Needs Common to all Alternatives:
Removal of old unsafe dam, dredge existing reservoir pool, enlarge gorge, phased improvement of fish screen, provide for passage of spawning gravel bedload, blockage of fall-run as needed, maintenance of a sand trap at the dam as needed and safely accommodate future public use.

Filename: NOTES718.97

Date: July 18, 1997

Subject: Notes from July 18, 1997, Clear Creek – Saeltzer Dam Fish Passage Project Meeting at the DWR office in Red Bluff

Attendees: DFG – Paul Ward, Harry Rectenwald
DWR - Kevin Dossey, Bill Mendenhall,
TFWDC - Norman Braithwaite

DWR/Group down to 3 alternatives.
Alternative 4 - low head dam will stress fish less, both adult and juvenile.
CalFed proposal limited to six pages of project description.
One option is to wait until November funding round.

N: Proposal - 2 phases: 1)design, 2) construction
CalFed wants 1 project proposal.
B: Not necessary to be so specific.

Issues:

1) Access
H: At dam, DFG owns, access at new site in escrow to BLM from Schmitt.
South access - WSRCD looked at highway access OK (legal), some steep.
South side access is through Mr. Pair off China Gulch Road.
Harry will check right-of-way through Pair; Legal Easement?

2) Screen - Harry says build box at new dam site for the screen based on usage, not water rights.

Paul: Same size will be a negative impact in CEQA document.
N: Box could be sized for 55 cfs.
H: Cost/Benefit ratio is better if DFG installs screen.
K: +$100,000 for metal ups the value to fish - positive impact
N: Will check with McConnell foundation if OK.
H: McConnell is nervous.
Harry will check with Phil Warner, DFG, on the commitment to maintain screen.
O&M for screen: DFG responsible ($ for ladder) per agreement. New ditch will be TFWDC responsibility. New ladder and screen could be responsibility of TFWDC. Make sure agreed upon and in proposal.

TFWDC wants open ditch. Norm wants pipe because ditch would be 20' wide, pipe would only cut a 8' wide swath.
Ditch loss could be high.
Dam: ~200' concrete then earthen dam at 3' above 100 year flood elevation.
Pipe 42"- 48" @ 4.5 fps = 55cfs.

Gorge: Upper is 25' wide, lower is 40' wide. Make upper like lower.

Water Rights: Moving Point of Diversion will require filing petition.

N: Environmental documents: North State Resources (Tim) - 4 to 6 months to complete. Tim will take environmental documents and permits for construction After DWR environmental documentation Is done.

Summer of 1998 probably too soon for construction.
Schmitt has mineral rights (dredging).
N: Siphon is too costly and no cleanout possible. Pipe - fence, concrete piers (~8' high)

DWR will survey in gorge, 1' contours + boulders.

Diversion of water during construction: Open tunnel/ladder (25 cfs), TFWDC ditch (20 cfs), = - 45cfs from channel.

Shasta County may become lead agency. (CEQA)

H: CVPIA money for 1 part, e.g. dredge and dam removal
Harry will write paragraph on 1086 - steelhead, CVPIA-FRP
DFG action plan, spring run status report, CAT III technical review committee documents.

N: Geotech - Kleinfelder $ quote - several backhoe test pits, seismic echo study across channel for $7,000.

DWR Geology Unit did seismic echo study across channel at dredging site.
Construction timing: pipe - out of stream work is of no consequence.

B: September draft document with alternatives
Environmental draft document with alternatives.

DWR advantage: Geotech, detailed survey can be done before funding

Need estimate of contribution by DWR on above, plus inspection of construction.

Mark Traiwyck of Ray Toney & Associates did cost estimate for Norman.

Complete photo documentation of dam may be necessary.

Jim DeStaso is concerned about contract funds designated for fish ladder **at** Saeltzer Dam. (Maybe not OK for upstream.)

Filename: NOTES722.97

Date: July 22, 1997

Subject: Notes from July 22, 1997, Clear Creek – Saeltzer Dam Fish Passage Project Meeting at the DFG Cantera Loop office in Redding

Attendees: DFG - Paul, Harry Rectenwald, Phil Warner
DWR - Kevin Dossey, Bill Mendenhall
BOR - Jim DeStaso
BLM - Steve Borchard
USFWS - Matt Brown
NRCS - Bob Bailey
WSRCD - Jeff Souza
TFWDC - Norman Braithwaite

Access: Steve B. looked at alignment of ditch.
All on Schmidt & DFG property.

H: Easement 1) off China Gulch through Pear - need legal easement
Or 2) Cloverdale Road through Skellinger, 3) through Maxwell, or 4) off of Clear Creek Road.

H: Alternative 4 benefits: Juvenile Passage better + 7/15/97 memo.
1/3 concrete as replacing existing

Steve: Safety-low head dams trap people at base of dam. Design to avoid.
Sediment?
Harry wants flashboards in dam for passing bedload.
He said access easement should cost $300 to $2,000. Construction of road + O&M - DFG or TFWDC
Drainage & Gravel surface-Who maintains?

H: TFWDC will need to pick up O&M for screen.
N: Concrete Packerhead Pipe
Siphon above existing dam could be exposed if degraded.

20 cfs diversion not high on priority of CVPIA.
Maintenance cost of screens ~ $2000 nuts & bolts.
Power Cost
Needs cost and cost share of screen design portion for proposal.
$100,000 BOR (CVPIA) + $50,000 DFG (Tracy Pumps)
Surveying, Geotech, screen and ladder, dam design.

H: Who will take lead in easement issue?

Private would be best (TFWDC)
Jeff Swanson says no need to file application for changing location of point of diversion.
P: It is a CEQA issue, therefore up for public review.

DWR will provide draft CEQA document, address mitigation.
BOR & BLM will co-lead NEPA document.
CEQA- Shasta County or DFG.

Construction schedule- 2 seasons/phases
1st- pipeline, headworks, ½ dam, screen, base, etc.
2nd- Divert water through pipe and tunnel, dredge, blow out dam, gorge work, other ½ of dam.

N: Who will review structural calculations for dam?
B: DWR can review
N: Doesn't want dam safety to review.
Steve: BLM will review (Dam will be on BLM land).
Matt: NMFS & BOR will review fishery aspect.
Review of ladder & screen by George Heise & Dan Odenweller, DFG & Marcin Whitman, NMFS
Structural review: DWR, BLM, BOR

BLM will want to place property "out of bounds to public" because of the danger and because it is an attractive nuisance.

Will want to keep the tunnel accessible.

Alternative 7 is on the same order of magnitude of as Alt. 4.

Norm will write draft proposal.

Matt: Include new screen in proposal because there may not be CVPIA funds later.

CVPIA can potentially fund whole project.

Filename: NOTES724.97

Date: July 24, 1997

Subject: Notes from July 24, 1997, Clear Creek – Saeltzer Dam Fish Passage Project Meeting (and conference call) at the DFG office in Redding

Attendees: DFG – Harry Rectenwald, Phil Warner
DWR - Kevin Dossey
TFWDC - Norman Braithwaite, Jeff Swanson (phone)
BOR – Jim DeStaso

Issues of project proposal to CalFed:
W/R's
Maintenance

Jeff: Can move Point of Diversion, won't file a petition.
Assumed DFG would have someone come by occasionally to maintain screen and ladder.
Phil: Check screen, clean, lubricate, Velocities's
Jim: High flow damage? Design to protect.

Jeff: Screen **is** in proposal; irrigator will be out there, so they can inspect screen.

Access and R/W:
Norm: It will be TFWDC's responsibility.
If no R/W, can up cost & go through BLM property.
Harry: Off of Cloverdale is best.
Skellinger, Rickey, & Schmitt are land owners.
R/W for dam & canal all on BLM. So OK.

Acceptance will be conditional that safety is met. BLM Engineer will review design.
Jeff: McConnell Foundation will seek R/W access.

Preliminary Design for each component.
DWR - Fish Ladder and Screen
Structural Engineer

Private/Public Partnership
Is it defined?

42" pipe @ 5 fps. Can cart people through it

Construction Management (FMCH said about $500,000) & Survey Staking

Jim: O&M $? When will TFWDC decide?

Phil: $2,000 he mentioned before for O & M is only for screen maintenance.

Norm: McConnell Foundation will probably accept responsibility for O&M. Can incorporate comments through tomorrow morning.

Norm: About 0.3% slope for ditch.

Memorandum

Date: August 8, 1997

To: Bill Mendenhall, DWR
Harry Rectenwald, DFG
Paul Ward, DFG
Norman Braithwaite, Inc.
Jim DeStaso, BOR

From: Kevin Dossey, DWR

Subject: Saeltzer Dam Fish Passage Project - Geologic Exploration at the Proposed Upstream Dam Location on Clear Creek

On August 6, 1997, three exploratory test holes were excavated at the approximate location of the proposed low head dam about 2000 feet upstream of Saeltzer Dam on Clear Creek. The proposed fish passage project, including the new dam site, was submitted to CalFed for consideration for funding after preparation by consulting engineer Norman Braithwaite for the Townsend Flat Water Ditch Company. A DWR, Northen District crew surveyed the proposed dam centerline profile and staked out proposed test hole excavation locations at 50' intervals. The three holes were dug along the proposed alignment, under provisions of a DFG "1603" Streambed Alteration Agreement, by Joe Tyler, BLM. Excavation was performed with a CAT-416B backhoe which had a maximum reach of 14 feet including the bucket. The excavations were directed by Kevin Dossey, DWR Associate Engineer and Frank Glick, DWR Supervising Engineering Geologist. Mr. Glick logged the information obtained from the test holes and will prepare a memo summarizing the findings.

Exposed bedrock in the existing stream channel defined the proposed test hole alignment, which was within 10 to 100 feet of the dam alignment proposed by Braithwaite. The test holes were excavated to 8 to 10 feet below the top of the alluvium on the south side of the creek. Refer to an attached "draft" diagram of the test hole elevations, prepared by Dossey. Note that the horizontal axis is not to scale. No bedrock was encountered at any of the holes, although a small (approximately 8" dia.) piece of angular rock similar to the exposed bedrock was found near the bottom of hole number 3 which was excavated to about 12 feet below the approximate proposed spillway elevation. The fact that no bedrock was encountered raises several issues regarding the proposed project.

Some of the potential issues associated with the proposed dam location are as follows:

- Part or most of the proposed dam spillway crest could be more than 12 feet above the bedrock in that location which could lead to serious problems associated with potential channel degradation below the proposed dam.

- When the sediment is removed from the pool above the existing dam and the dam is removed, the new channel invert will be up 20 feet below the top of the existing sediment just behind the dam which could cause a significant change in stream gradient between the existing dam location and the upstream end of the sediment dredging, which is about half way up to the proposed dam location. This could lead to upstream headcutting which could potentially reach the base of the proposed dam.

- If the channel downcuts to a water surface elevation potentially 12 feet or more below the present water surface elevation, the proposed fish ladder could be dewatered, causing a barrier that would require construction of an extension.

- If the potential channel degradation were to occur, a dam with similar height and liability problems as the existing dam could be created. If bedrock is even deeper, the headcutting problem and liability could be greater.

- If the proposed design is to include extending the dam to bedrock, the quantities and costs of the dam could increase significantly if bedrock is much deeper.

- If the dam is not designed to reach a bedrock foundation, the potential for eventual undermining during high flows could result in potential costs and liability for TFWDC.

- Maintenance required by prolonged scouring at the downstream toe of the dam could be an added O & M cost to be considered.

- If the channel degrades and re-routes away from the proposed fish ladder, re-channeling and/or extension of the fish ladder would be required to maintain fish passage.

These potential issues need to be addressed so DWR can decide in which direction to proceed.

Possible options for proceeding with work are as follows:

1.) Continue geologic exploration at the present site with a drill rig, recording the types of subsurface materials encountered and the depths to bedrock.

2.) Initiate several test excavations along a chosen profile upstream and downstream from the present site to locate an acceptable alternative dam site.

3.) Combination of options 1. and 2.

4.) Abandon this proposed project alternative.

August 8, 1997

Another possible exploration area would be the "plug" of sediment in the creek about 1000 feet upstream of Saeltzer Dam. Stability testing could be done to determine the potential extent of downcutting that could be expected in that area, which would give an idea of the probable stream gradient that could be expected after the creek reaches equilibrium. The information obtained from this area could be valuable for predicting if removal of the sediment and dam downstream might create passage problems in the "plug" area.

Drilling can be accomplished for about $1,500 per hole, including a geologist's time. About 2 holes can be drilled per day. With the money allocated for reconnaissance in the DWR contracts, about 8 holes could be drilled. Drilling could probably begin the first week of September.

Design notes:

1.) The DWR survey crew found that, at a flow of 52 cfs, the water surface elevation of the creek at the proposed dam site is about 1.2 feet higher than the water surface elevation of the pool above Saeltzer Dam (at the dam crest elevation at this flow).

2.) The 1997 high flow debris line was surveyed at an elevation of 565.5 feet at a location about 100 feet downstream of the proposed dam alignment.

Filename: testhole8-8.wpd

Filename: NOTES811.97

Date: August 11, 1997

Subject: Notes from August 11, 1997, Clear Creek – Saeltzer Dam Fish Passage Project Meeting at the DWR office Red Bluff

Attendees: DFG – Harry Rectenwald, Paul Ward
DWR - Kevin Dossey, Bill Mendenhall
TFWDC - Norman Braithwaite

N: New dam downstream of proposed site would not be good, too high
Seismic lines? Why drill now?
B: Drilling would show difference between deposited alluvium and pre-mining alluvium and fresh sediment.
N: Kleinfelder - $7,000 for seismic line, & 2 test holes. Cross-section & report @ 1 site.
Cost of seismic lines? Not broken out.
Pipe trench 5' to 8' deep.
Norm: Dam could be gravity + cutoff wall.

Need depth to bedrock. DWR - Koll's report has seismic line data and general info on bedrock depths.

CALFED will decide in November which projects will be funded (overwhelmed).
Once $ come in:
DWR-See proposal

B: Design Dam & Pipeline, quantity & cost

N: Pipeline:
Concrete Packerhead pipe (cheap)
S = .003 will pass 50 cfs.
42" pipe + 48" steel pipe - 50' spans for crossing (9/16" steel).
Could move crossing downstream of existing screen.
Survey down ditch about 400', 4 cross-sections.

H: moving dam site is better than increasing overall height.

Memorandum

Date: August 21, 1997

To: Bill Mendenhall, DWR
Harry Rectenwald, DFG
Paul Ward, DFG
Norman Braithwaite, Inc.
Jim DeStaso, BOR

From: Kevin Dossey, DWR

Subject: Saeltzer Dam Fish Passage Project - Alternatives for Proceeding with Geologic Exploration at the Proposed Upstream Dam Location on Clear Creek

After our meeting with DFG and Norman Braithwaite to discuss the potential issues associated with the proposed upstream dam location, I contacted Frank Glick, DWR Project Geology, to inquire about costs to determine seismic refraction lines. Several issues came up involving alternatives for proceeding with geologic exploration, including the reliability of the information to be obtained, the time frame for completing the exploration, and the relative costs of the alternative procedures. A decision about how to proceed, and with what funding, needs to be made ASAP so the work can be completed.

At the 8/11/97 meeting, we discussed obtaining data over a broader area, rather than drilling for data at specific locations. I relayed this information to Frank and he said the seismic refraction data alone can give an indication of the subsurface strata, but to be certain of the type of materials below the surface at various locations in the project area, the seismic refraction data should be correlated to known data, i.e., data obtained from drilling in that area. He also said the seismic refraction process won't work under water. So if seismic refraction data is desired at the alternative upstream dam site located about 400 feet upstream from the currently proposed upstream dam site, limited information could be obtained because more than half of the proposed dam alignment is covered with water.

Frank said it would cost about $10,000 to obtain the seismic refraction data along the lines proposed at the 8/11/97 meeting (total of about 2500 feet). This cost would include processing the data. To obtain the drilling data for correlation purposes would cost about $15,000. So for reliable seismic refraction line data, i.e., reliable enough to go to bid with, the total cost would be about $25,000.

Since the $25,000 is more than DWR has budgeted for, Frank suggested that we might want to get an excavator with a 20'+ reach to dig test holes at the various locations. At about $170 per hour, a large excavator could dig for a week for around $7,000. With greater mobility than the drilling and seismic equipment, a lot of useful information could

be obtained for a relatively low cost.

Since it might take too long (for the purpose of completing our report) for DWR to contract an excavator, I asked Norman if he could explore the possibility of having the Townsend Flat Water Ditch Company pay for an excavator to speed up the process while obtaining information useful for his final designs. He indicated that the TFWDC is not interested in completing a feasibility report, so they wouldn't be willing to pay for geologic exploration now that could be done as part of the final design phase of the project they have proposed. He also indicated he would be comfortable designing the project with seismic refraction data only (without drilling). He believes the area probably doesn't have decomposed bedrock and the echos from bedrock should be easily distinguishable from echos off of saturated alluvium. Assuming the project proposed to CalFed by TFWDC gets funded, the following questions come to mind:

1) Who will be the contract administrator? Braithwaite? DWR (as discussed at previous meetings, and encouraged by Braithwaite)?
2) Should DWR continue with geologic exploration as if DWR will be ultimately responsible for the contract and change orders, claims, etc.?
3) Should DWR perform the "best" exploration now (seismic lines and drilling)?
4) Who will fund the portion of the exploration that exceeds DWR funds allocated for reconnaissance?

With hopes of the DWR Project Geology section scheduling time for this project soon, a consensus decision as to how to proceed should be made now. Please give me your input as soon as possible.

Filename: Geoalts8-21.wpd

Memorandum

Date: September 17, 1997

To: Bill Mendenhall, DWR
Harry Rectenwald, DFG
Paul Ward, DFG
Norman Braithwaite, Inc.
Jim DeStaso, BOR

From: Kevin Dossey, DWR

Subject: Saeltzer Dam Fish Passage Project on Clear Creek - Update on Geologic Exploration at the Proposed Upstream Dam Location

On August 22, 1997, I called Norman Braithewaite to discuss the geologic exploration in the Saeltzer Dam Fish Passage Project area. He said he would prefer to have both seismic refraction line data as well as information obtained from drilling to aid in the final design of the proposed upstream dam and diversion pipeline. Also, Bill Mendenhall called Jim DeStaso to discuss potential issues associated with the proposed upstream dam location and the need for further geologic exploration. Bill explained that since no bedrock was encountered while digging to a depth of 12 feet below the approximate elevation of the top of the proposed upstream dam crest, more data would need to be collected than originally planned or budgeted for. The additional areas of exploration will aid in DWR's development of a preliminary design and cost estimate for the upstream dam and pipeline project alternative proposed to CalFed by the Townsend Flat Water Ditch Company. And the data will be used by Braithewaite for final designs, assuming the project will be funded. Jim indicated that additional BOR funding could be made available later if DWR spent additional funds on geologic exploration now.

With the involved parties concurring on how to proceed, I called Frank Glick, DWR Project Geology, to schedule collection of seismic refraction line and core drilling data. He scheduled the seismic line work for the week of September 2 and drilling for late September or early October. The geology report should be completed in October.

DWR Northern District staff assisted Bob Conover, DWR Project Geology, in collecting seismic refraction line data, beginning on September 2. Data collection along 13 lines, totaling 2,108 feet, was completed on September 8. Data processing began September 9. When drilling is completed, the drilling data will be used to correlate with the seismic refraction data, verify depths to bedrock, and type of bedrock, identify faults, and compile other subsurface information.

Filename: Geoprog9-17.wpd

Memorandum

Date: September 30, 1997

To: Jim DeStaso, BOR
Harry Rectenwald, DFG
Paul Ward, DFG
Norman Braithwaite, Inc.
Bill Mendenhall, DWR

From: Kevin Dossey, DWR

Subject: Saeltzer Dam Fish Passage Project on Clear Creek - Status of DWR Preliminary Engineering Study

As outlined in Paul Ward's August 28, 1997 letter to Ron Brockman, BOR, requesting an extension of time for Grant Agreement No. 6-FG-20-14120 with DWR, the anticipated schedule for the Saeltzer Dam Fish Passage Project Preliminary Engineering Study called for completion of a Draft Report by September 30, 1997 and a Final Report by November 30, 1997. Since that letter, the Clear Creek Work Group agreed that DWR should expand the geologic exploration to include the areas of the proposed upstream dam and pipeline project alternative proposed to CalFed by the Townsend Flat Water Ditch Company. Because of the additional work created by the expanded scope of geologic exploration and engineering, the Draft Report is now expected to be ready for review by November 30. The Final Report will be completed by December 31.

Core drilling dates are not confirmed yet, but we expect P.C. Exploration to have equipment available within two to three weeks. Then, correlating that data with the seismic refraction line data will mean that finalized geologic information may not be available until early or mid-November. We are proceeding with the study, using preliminary geologic data for our preliminary designs and quantity and cost estimates, making geological assumptions where necessary. As more data becomes available, it will be incorporated into our study where possible. The final geology report data can then be used in the final design process.

Filename: CCprog9-30.wpd

Filename: NOTES1020.97

Date: October 20, 1997

Subject: Notes from October 20, 1997, Clear Creek - Saeltzer Dam Fish Passage Project meeting at the DWR office in Red Bluff

Attendees: DFG - Harry Rectenwald, Paul Ward, George Heise
DWR - Kevin Dossey, Bill Mendenhall, Bill McLaughlin, Jim West
Consultant for MWD - Jim Buell

Put screen & headworks near ladder if possible, pipe in dam to right bank. Maybe in final design.

Dam Design ? Concrete gravity.

Ladder Design:
George tested Parrott Phelan pool and chute ladder model @ 6', 8', and 10' baffle spacing. 6' was not good.

CVPIA & Prop. 204 funds are available for this project.

Still concern about potential headcutting.

Harry: How about remove dam, pump water to district until creek reaches equilibrium, i.e., headcutting stops.

DWR will look at rough pump station cost.

Alternative 3:
- With screen and new dam.
- Need to use non-puddling pipe.
- Dam should extend all the way to bedrock.
- George would go with pool and chute ladder, extended to up to 12' head difference.

Alternatives 1 and 2:
- 120 cfs auxiliary water to make fish attraction characteristics of alternatives 1 and 2 comparable to alternative 3 pool and chute ladder.
- Larger entrance pool.

file copy

STATE OF CALIFORNIA—THE RESOURCES AGENCY

PETE WILSON, Governor

DEPARTMENT OF FISH AND GAME

97-0807

601 LOCUST STREET
REDDING, CA 96001
(916) 225-2300

August 4, 1997

Notification No. 97-0807

Date Received August 4, 1997

RECEIPT OF NOTIFICATION

Mr. Steve Borchard
Bureau of Land Management
355 Hemsted Drive
Redding, California 96002

Post-It™ brand fax transmittal memo 7671 | # of pages ▸

To Kevin Dosser	From R. Reetano
Co.	Co.
Dept.	Phone #
Fax #	Fax #

Dear Mr. Borchard:

We have received your notification of proposed operations on Clear Creek of Shasta County in the S31,35 T31N, RW.

Your proposed operation has been given notification number 97-0807, and assigned to a Department representative who will contact you soon.

Under provisions of the Fish and Game Code, you may not begin work on your proposed project until the Department has conducted an inspection and its recommendations (or, if an agreement cannot be reached, the decision of an arbitration panel) have been incorporated into your project.

The provisions of the Fish and Game Code are intended to protect and conserve California fish and wildlife resources.

We look forward to working with you.

Sincerely,

Richard L. Elliott

Richard L. Elliott
Regional Manager

RLE:mrw/sg

cc: Lt. Taylor
Wdn. Matirko
CVRWQCB
Rec. Board
Mr. Bill Walker, Shasta County Planning Division

Notification No. 970807 THP No. _____

AGREEMENT REGARDING PROPOSED STREAM OR LAKE ALTERATION

THIS AGREEMENT, entered into between the State of California, Department of Fish and Game, hereinafter called the Department, and Bureau of Land Management of Redding, State of CA, hereinafter called the operator, is as follows:

WHEREAS, pursuant to Division 2, Chapter 6 of California Fish and Game Code, the operator, on the 4th day of August, 1997, notified the Department that he intends to substantially divert or obstruct the natural flow of, or substantially change the bed, channel, or bank of, or use material from the streambed of, the following water: Clear Creek, in the County of _____, State of California, S31-35 T_____ R_____. Upstream of Highway 273 Bridge and downstream of Clear Ck Rd. Bridge

WHEREAS, the Department (represented by Harry Rectenwald has made an inspection of subject area on the _____ day of numerous occasions, 19___, and) has determined that such operations may substantially adversely affect existing fish and wildlife resources including: anadromous and resident fish life *

THEREFORE, the Department hereby proposes measures to protect fish and wildlife during the operator's work. The operator hereby agrees to accept the following recommendations as part of his work: Numbers 1, 18, 19, 20, 22 from the list of recommendations on the back of this page and the following special recommendations:

Nov. 30, 1997 HJR

1. All work in or near the stream or lake shall be confined to the period Aug 1 to ~~Sept 30~~ 11/3/97

Agreement is for work related to fishery restoration and watershed rehabilitation projects.

- No Fee -

Add 11/97 * Test holes in stream shall not exceed 2 feet in depth and after each digging effort there will be a pause sufficiently long enough to let water clear in the riffle.

Check turbidity plume at downstream end of pool below riffle and halt operation if turbidity goes beyond pool

RECEIVED AUG - 8 1997 Dept. of F&G Region 1

The operator, as designated by the signature on this agreement, shall be responsible for the execution of all elements of this agreement. A copy of this agreement must be provided to contractors and subcontractors and must be in their possession at the work site.

If the operator's work changes from that stated in the notification specified above, this agreement is no longer valid and a new notification shall be submitted to the Department of Fish and Game. Failure to comply with the provisions of this agreement and with other pertinent Code Sections, including but not limited to Fish and Game Code Sections 5650, 5652 and 5948, may result in prosecution. Harry Rectenwald 8/5/97

Nothing in this agreement authorizes the operator to trespass on any land or property, nor does it relieve the operator of responsibility for compliance with applicable federal, state, or local laws or ordinances.

THIS AGREEMENT IS NOT INTENDED AS AN APPROVAL OF A PROJECT OR OF SPECIFIC PROJECT FEATURES BY THE DEPARTMENT OF FISH AND GAME. INDEPENDENT REVIEW AND RECOMMENDATIONS WILL BE PROVIDED BY THE DEPARTMENT AS APPROPRIATE ON THOSE PROJECTS WHERE LOCAL, STATE, OR FEDERAL PERMITS OR OTHER ENVIRONMENTAL REPORTS ARE REQUIRED.

This agreement becomes effective on Aug. 4th 1997

Operator Steven J Bradley/Harry Rectenwald

Title Project Mgr

Organization BLM

Date 8/4/97

Department Representative Harry Rectenwald

Title Environmental Specialist IV

Department of Fish and Game, State of California

Date 8/4/97

*If inspection was not made, cross out words within parentheses.

FG 1060 (5-87) 87 82406

...s has 30 days from date of ...mpleted application in which ...s recommendations. This time ...oes not begin until the department ...es the appropriate fee (see attached ...schedule).

fee exempt

T.H.P. No. _____

Notification No. 97-0807 Received 8-4-97

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF FISH AND GAME

NOTIFICATION OF REMOVAL OF MATERIALS AND/OR ALTERATION OF LAKE, RIVER, OR STREAMBED BOTTOM, OR MARGIN

A. APPLICANT Pursuant to Sections 1601–1607 of the California Fish and Game Code

I, Steve Borchard (Name of Applicant) of 355 Hemsted Dr. Redding CA 96002 (Mailing Address),

Representing Bureau of Land Management
Name and address of Individual, Agency, Company, etc. owning property or doing work.

Hereby notify the California Department of Fish and Game of operations to be carried out by or for me

from Aug 4, 1997 (Starting Date) to ~~August~~ September 31, 1997 (Ending Date) on or affecting

Clear Creek (Name of Stream, River, or Lake) of Shasta County, tributary to Sacramento River (Major Water Body)

Located Upstream of Highway 273 and downstream of Clear Creek Road bridge
Distance and Direction to Landmarks

Section Sections 31-35 Township 31 N Range R W

USGS Map Redding Co. Assessor's Parcel No. many

Property owners name and address (if different from applicant) Bill Schmitt, 16855 Clear Creek Rd, Redding CA

John Osborn
Name of Person to Be Contacted at Site During Operations is responsible for operations at the site.

He/she can be reached at 3179 Bechelli Lane, Suite 110, Redding CA 96002 (Mailing Address) 246 5299 (Telephone)

B. Description of operation 1. The nature of said operations will be as follows:

Check all squares which apply.

- [x] Soil, sand, gravel, and/or boulder removal or displacement
- [ ] Water diversion or impoundment
- [ ] Mining—other than aggregate removal
- [ ] Road or bridge construction
- [ ] Levee or channel construction
- [ ] Timber harvesting or any related activity required for harvesting timber
- [ ] Temporary, recreational or irrigation dam
- [ ] Fill or spoil in bed, bank, or channel
- [x] Other—Describe below Watershed restoration project stream crossing w/ rubber tired equipment

2. Type of material removed, displaced or added ☐ Soil ☐ Sand ☑ Gravel ☐ Boulders
Volume _____

RECEIVED
AUG - 4 1997
Dept. of F&G Region 1

3. Equipment to be used in the described site Rubber tire backhoe tractor

4. Use of water (i.e., domestic, irrigation, gravel, washing, etc.) _____ Quantity _____

5. Describe type and density of vegetation to be affected, and estimate area involved.
3 month old willow

6. What actions are proposed to protect fish and wildlife resources and/or mitigate for project impacts? use clean rubber tired equipment and existing road systems to extent possible.

7a. Does project have a local or state lead agency or require other permits? ☐ Yes ☑ No

7b. If 7a answer is yes, please attach or identify any available environmental document.

7c. For state-designated wild and scenic rivers, a determination of the project's consistency with the California Wild and Scenic Rivers Act must be made by the Secretary for Resources. Until the Secretary determines the project is consistent with the Act, the Department cannot issue a valid agreement. A tentative agreement will be issued, conditioned upon a finding of consistency by the Resources Secretary.

7d. THIS AGREEMENT IS NOT INTENDED AS AN APPROVAL OF A PROJECT OR OF SPECIFIC PROJECT FEATURES BY THE DEPARTMENT OF FISH AND GAME. INDEPENDENT REVIEW AND RECOMMENDATIONS WILL BE PROVIDED BY THE DEPARTMENT AS APPROPRIATE ON THOSE PROJECTS WHERE LOCAL, STATE, OR FEDERAL PERMITS OR OTHER ENVIRONMENTAL REPORTS ARE REQUIRED.

8. Briefly describe proposed construction methods. Attach diagram or sketch of the location of your operation to clearly indicate the stream or other water and access and distance from named public road. Indicate locked gates with an "X". Show existing features with a solid line (————) and proposed features with a broken line (– – – – – –). Show compass direction. Attach larger scale map if necessary.

Steve J Borchard 8/4/97
Signature of Applicant Date

NO CARBON NEEDED
FG2023 (Rev. 11/87)

87 8340

RECOMMENDATIONS

1. Disturbance or removal of vegetation shall not exceed the minimum necessary to complete operations. The disturbed portions of any stream channel or lake margin within the high water mark of the stream or lake shall be restored to as near their original condition as possible.

2. Restoration shall include the revegetation of stripped or exposed areas.

3. Rock, riprap, or other erosion protection shall be placed in areas where vegetation cannot reasonably be expected to become reestablished.

4. Installation of bridges, culverts, or other structures shall be such that water flow is not impaired and upstream or downstream passage of fish is assured at all times. Bottoms of temporary culverts shall be placed at or below stream channel grade. Bottoms of permanent culverts shall be placed below stream channel grade.

5. Plans for design of concrete sills and other features that could potentially impede fish migrations must be approved by Department engineers.

6. When any dam (any artificial obstruction) is being constructed, maintained, or placed in operation, sufficient water shall at all times be allowed to pass downstream to maintain fishlife below the dam.

7. An adequate fish passage facility must be incorporated into any barrier that obstructs fish passage.

8. Any temporary dam (any artificial obstruction) constructed shall only be built from material such as clean gravel which will cause little or no siltation.

9. No equipment will be operated in live stream channels.

10. Equipment shall not be operated in the stream channels of flowing live streams except as may be necessary to construct crossings or barriers and fills at channel changes.

11. When work in a flowing stream is unavoidable, the entire streamflow shall be diverted around the work area by a barrier, temporary culvert, and/or a new channel capable of permitting upstream and downstream fish movement. Construction of the barrier and/or the new channel shall normally begin in the downstream area and continue in an upstream direction, and the flow shall be diverted only when construction of the diversion is completed. Channel bank or barrier construction shall be adequate to prevent seepage into or from the work area. Channel banks or barriers shall not be made of earth or other substances subject to erosion unless first enclosed by sheet piling, rock riprap, or other protective material. The enclosure and the supportive material shall be removed when the work is completed and the removal shall normally proceed from downstream in an upstream direction.

12. Temporary fills shall be constructed of nonerodible materials and shall be removed immediately upon work completion.

13. Equipment shall not be operated in the lake or its margin except during excavation and as may be necessary to construct barriers or fills. If work in the lake is unavoidable, a curtain enclosure to prevent siltation of the lake beyond the immediate working area shall be installed. The enclosure and any supportive material shall be removed when the work is completed.

14. Silt settling basins shall be located away from the stream or lake to prevent discolored, silt-bearing water from reaching the stream or lake.

15. Preparation shall be made so that runoff from steep, erodible surfaces will be diverted into stable areas with little erosion potential. Frequent water checks shall be placed on dirt roads, cat tracks, or other work trails to control erosion.

16. Wash water containing mud or silt from aggregate washing or other operations shall not be allowed to enter a lake or flowing streams.

17. a) A silt catchment basin shall be constructed across the stream immediately below the project site. This catchment basin shall be constructed of gravel which is free from mud or silt.
b) Upon completion of the project and after all flowing water in the area is clear of turbidity, the gravel along with the trapped sediment shall be removed from the stream.

18. If operations require moving of equipment across a flowing stream, such operations shall be conducted without substantially increasing stream turbidity. For repeated crossings, the operator shall install a bridge, culvert, or rock-fill crossing as specified in comments below.

19. If a stream channel has been altered during the operations, its low flow channel shall be returned as nearly as possible to its natural state without creating a possible future bank erosion problem, or a flat wide channel or sluice-like area. If a lake margin has been altered, it shall be returned as nearly as possible to its natural state without creating a future bank erosion problem. The gradient of the streambed or lake margin shall be as nearly as possible the same gradient as existed prior to disturbance.

20. Structures and associated materials not designed to withstand high seasonal flows shall be removed to areas above the high water mark before such flows occur.

21. No debris, soil, silt, sand, bark, slash, sawdust, rubbish, cement or concrete or washings thereof, oil or petroleum products or other organic or earthen material from any logging, construction, or associated activity of whatever nature shall be allowed to enter into or placed where it may be washed by rainfall or runoff into, waters of the State. When operations are completed, any excess materials or debris shall be removed from the work area. No rubbish shall be deposited within 150 feet of the high water mark of any stream or lake.

22. The operator will notify the Department of Fish and Game of the date of commencement of operations and the date of completion of operations at least five days prior to such completion.

The department has 30 days from date of receipt of a completed application in which to make its recommendations. This time period does not begin until the department receives the appropriate fee (see attached fee schedule).

T.H.P. No. _____

Notification No. 97-0814 Received _____

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF FISH AND GAME

NOTIFICATION OF REMOVAL OF MATERIALS AND/OR ALTERATION OF LAKE, RIVER, OR STREAMBED BOTTOM, OR MARGIN

A. APPLICANT Pursuant to Sections 1601–1607 of the California Fish and Game Code

I, Kevin Dossey (Name of Applicant) of Red Bluff (Mailing Address),

Representing Dept. Water Resources (Name and address of Individual, Agency, Company, etc. owning property or doing work.)

Hereby notify the California Department of Fish and Game of operations to be carried out by or for me

from August 4 (Starting Date) to Sept. 30 (Ending Date) on or affecting

Clear Ck (Name of Stream, River, or Lake) of Shasta County, tributary to Sacramento River (Major Water Body)

Located in the immediate vicinity of Saeltzer Dam (Distance and Direction to Landmarks)

Section _____ Township _____ Range _____

USGS Map _____ Co. Assessor's Parcel No. _____

Property owners name and address (if different from applicant) Dept. of Fish and Game

Kevin Dossey (Name of Person to Be Contacted at Site During Operations) is responsible for operations at the site.

He/she can be reached at _____ (Mailing Address) _____ (Telephone)

B. Description of operation 1. The nature of said operations will be as follows:
Check all squares which apply.

- ☑ Soil, sand, gravel, and/or boulder removal or displacement
- ☑ Water diversion or impoundment
- ☐ Mining—other than aggregate removal
- ☐ Road or bridge construction
- ☐ Levee or channel construction
- ☐ Timber harvesting or any related activity required for harvesting timber
- ☐ Temporary, recreational or irrigation dam
- ☐ Fill or spoil in bed, bank, or channel
- ☐ Other—Describe below Divert water around gorge below dam to complete an engineering survey for fishery restoration project

2. Type of material removed, displaced or added ☐ Soil ☐ Sand ☐ Gravel ☐ Boulders
Volume < 20 cu yd of which 10 cu yd fill
3. Equipment to be used in the described site hand tools / backhoe or tractor
4. Use of water (i.e., domestic, irrigation, gravel, washing, etc.) NA Quantity _____
5. Describe type and density of vegetation to be affected, and estimate area involved.
none
6. What actions are proposed to protect fish and wildlife resources and/or mitigate for project impacts? Sequencing diversion works to avoid turbidity and allowing some leakage down gorge during survey to keep fish life alive
7a. Does project have a local or state lead agency or require other permits? ☐ Yes ☒ No
7b. If 7a answer is yes, please attach or identify any available environmental document.
7c. For state-designated wild and scenic rivers, a determination of the project's consistency with the California Wild and Scenic Rivers Act must be made by the Secretary for Resources. Until the Secretary determines the project is consistent with the Act, the Department cannot issue a valid agreement. A tentative agreement will be issued, conditioned upon a finding of consistency by the Resources Secretary.
7d. THIS AGREEMENT IS NOT INTENDED AS AN APPROVAL OF A PROJECT OR OF SPECIFIC PROJECT FEATURES BY THE DEPARTMENT OF FISH AND GAME. INDEPENDENT REVIEW AND RECOMMENDATIONS WILL BE PROVIDED BY THE DEPARTMENT AS APPROPRIATE ON THOSE PROJECTS WHERE LOCAL, STATE, OR FEDERAL PERMITS OR OTHER ENVIRONMENTAL REPORTS ARE REQUIRED.
8. Briefly describe proposed construction methods. Attach diagram or sketch of the location of your operation to clearly indicate the stream or other water and access and distance from named public road. Indicate locked gates with an "X". Show existing features with a solid line (————) and proposed features with a broken line (– – – – – –). Show compass direction. Attach larger scale map if necessary.
see attached photo & mylar

NO CARBON NEEDED
FG2023 (Rev. 11/87)

C-36

Kevin L. Dossey 8/11/97
Signature of Applicant Date

87 83409

Notification No. 97 0814 THP No. _____

AGREEMENT REGARDING PROPOSED STREAM OR LAKE ALTERATION

THIS AGREEMENT, entered into between the State of California, Department of Fish and Game, hereinafter called the Department, and Department of Water Resources of Red Bluff, State of CA, hereinafter called the operator, is as follows:

WHEREAS, pursuant to Division 2, Chapter 6 of California Fish and Game Code, the operator, on the _____ day of _____, 19____, notified the Department that he intends to substantially divert or obstruct the natural flow of, or substantially change the bed, channel, or bank of, or use material from the streambed of, the following water: Clear Creek, in the County of _____, State of California, S_____ T_____ R_____ @ Sealtzer Dam

WHEREAS, the Department (represented by Wdw Matisko has made an inspection of subject area on the _____ day of Numerous occasions, 19 ___, and) has determined that such operations may substantially adversely affect existing fish and wildlife resources including: resident fish.

THEREFORE, the Department hereby proposes measures to protect fish and wildlife during the operator's work. The operator hereby agrees to accept the following recommendations as part of his work: Numbers 10, 12, 19, 20, 21 and 22 from the list of recommendations on the back of this page and the following special recommendations:

1. All work in or near the stream or lake shall be confined to the period August 4 to September 30.
2. Use Sandbag berms to divert water around approximately 75 ft. of gorge below Sealtzer Dam.
3. Use partially completed ditch system around perimeter of the reservoir to convey water to ditch system and waste gate below the Dam. The diversion shall be activated according to procedure number 11 on the back of this agreement.
4. Allow some leakage in gorge survey area to keep any fish life alive.
5. Fee Exempt Fishery Restoration Project

The operator, as designated by the signature on this agreement, shall be responsible for the execution of all elements of this agreement. A copy of this agreement must be provided to contractors and subcontractors and must be in their possession at the work site.

If the operator's work changes from that stated in the notification specified above, this agreement is no longer valid and a new notification shall be submitted to the Department of Fish and Game. Failure to comply with the provisions of this agreement and with other pertinent Code Sections, including but not limited to Fish and Game Code Sections 5650, 5652 and 5948, may result in prosecution.

Nothing in this agreement authorizes the operator to trespass on any land or property, nor does it relieve the operator of responsibility for compliance with applicable federal, state, or local laws or ordinances.

THIS AGREEMENT IS NOT INTENDED AS AN APPROVAL OF A PROJECT OR OF SPECIFIC PROJECT FEATURES BY THE DEPARTMENT OF FISH AND GAME. INDEPENDENT REVIEW AND RECOMMENDATIONS WILL BE PROVIDED BY THE DEPARTMENT AS APPROPRIATE ON THOSE PROJECTS WHERE LOCAL, STATE, OR FEDERAL PERMITS OR OTHER ENVIRONMENTAL REPORTS ARE REQUIRED.

This agreement becomes effective on Signature

Operator Mark L Dossey

Title ASSOCIATE ENGINEER

Organization DEPT. OF WATER RESOURCES

Date 8/11/97

Department of Fish and Game, State of California

Department Representative

Title

Date August 5, 1997

*If inspection was not made, cross out words within parentheses.

FG 1060 (5-87) 87 82406

STATE OF CALIFORNIA
OFFICE MEMO
STD. 100 (REV. 4-95)

DATE 9/26/97

TO Kevin Dossey
DWR

ROOM/STA. NO.

FROM Harry Reetz

PHONE NUMBER CALNET

ROOM/STA. NO.

SUBJECT Clear Creek Work

No agreement for streambed alteration necessary for the exploratory drilling project you described today as follows:

- No drilling in the stream
- Drilling in month of October
- No discharge of drilling muds.

The stream reach is above Saeltzer Dam - a blockage to anadromous fish migration during October

Thank you for the notification

Harry Reetz

95 28511

State of California The Resources Agency

Memorandum

Date : November 11, 1997

To : Al Cathey
Shasta County Road Dept.
1855 Placer St.
Redding, Ca.96001

From : Jim West
Department of Water Resources
2440 Main St.
Red Bluff, Ca. 96080

Subject: Possible Clear Creek Road ROW Encroachment

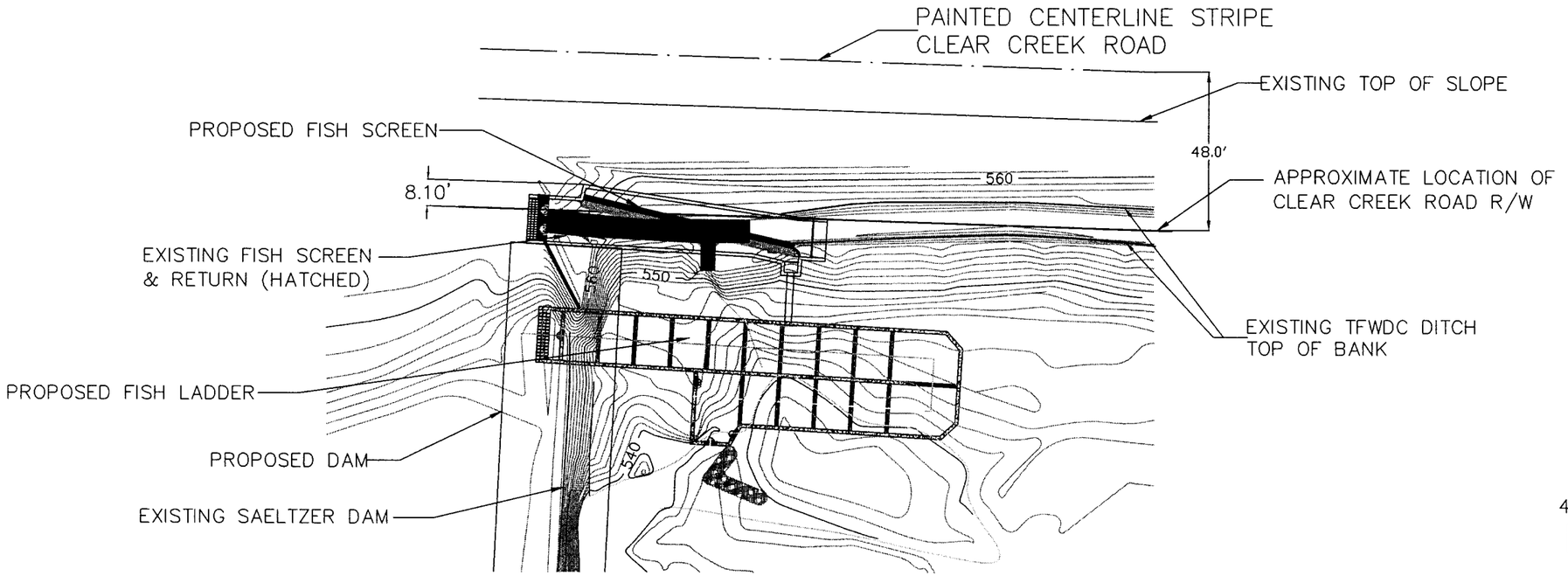
Attached please find a copy of the assessor's map and existing road plans for Clear Creek Road in the vicinity of Saeltzer Dam (S1/2, Sec. 31,T.31N.,R5W.) Also attached is a copy of possible improvements to the existing Townsend Flat Water Ditch Company (TFWDC) irrigation canal.

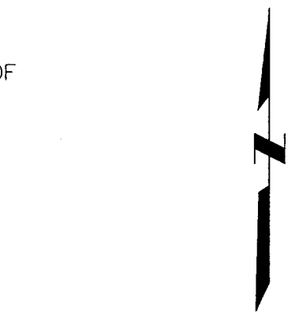
Our department is currently working on a feasibility study for fish passage alternatives around or through Saeltzer Dam. One of our possible designs includes the replacement of the existing TFWDC dam, headworks and fish screen. This design would cause an encroachment of approximately 8.1 feet into the Clear Creek Road Right-Of-Way. As you can see from the existing road plans, the existing ditch currently meanders in and out of the right-of-way. Although we are only at the feasibility study level, our department would like to know if an encroachment would be allowable. Thank you for your time.

Sincerely,

Jim West, Asst. Land Surveyor

ALTERNATIVE 2 FISH SCREEN AND LADDER LAYOUT





Scale 1" = 40'

SAELTZER DAM FISH PASSAGE PROJECT Clear Creek near Redding, California	CLEAR CREEK ROAD ENCROACHMENT	STATE OF CALIFORNIA THE RESOURCES AGENCY DEPARTMENT OF WATER RESOURCES NORTHERN DISTRICT Revision Date: November 11, 1997	DRAWING : ROADSUBMIT Sheet 1 of 1

SHASTA COUNTY

DEPARTMENT OF PUBLIC WORKS

1855 PLACER STREET
REDDING, CA 96001-1795
(916) 225-5661
FAX (916) 225-5667
DPW/ROADS 1-800-479-8022

WILLIAM E. LYMAN
DIRECTOR

December 9, 1997

Jim West
Department of Water Resources
2440 Main Street
Red Bluff, CA 96080

Subject: Clear Creek Road Encroachment

Dear Mr. West:

We have reviewed your proposal for the possible replacement of the Townsend Flat Water Ditch Company Dam. Based on the information you have sent us, we see no problem in issuing an encroachment permit to you.

Very truly yours,

William E. Lyman, Director

By Bruce A. Carter
Bruce A. Carter
Traffic Engineer

BAC/lr

Memo to File

Date: January 29, 1998

Subject: Notes from the January 29, 1998, Clear Creek – Saeltzer Dam Fish Passage Project Meeting at the DWR office in Red Bluff

Attendees: DFG - Paul Ward, Harry Rectenwald, Terry Healy
DWR - Kevin Dossey
BOR - Jim DeStaso
USFWS - Matt Brown
NRCS - Gerry Hubatka
TFWDC - Norman Braithwaite

This meeting was called to:

1. Review the status of the DWR Saeltzer Dam Fish Passage Project Preliminary Engineering Technical Report.
2. Address comments, additions, and changes to the draft report.
3. Discuss new developments and the status of the Townsend Flat Water Ditch Company's CalFed proposal.
4. Review Mr. Braithwaite's draft Work Plan that is to be to be submitted to CalFed.
5. Discuss the work plan schedule, funding, program management, and personnel needs.

1. The draft DWR preliminary engineering report had been mailed to scoping team members in December, 1997 for review and comments to be incorporated into the final report. No written comments had yet been received by DWR.

2. Most of the following comments discussed at this meeting will be incorporated into the final report.

Mr. Braithwaite pointed out that he was not hired by TFWDC, but was asked to prepare a CalFed proposal.

Mr. Rectenwald did not release his written comments, as they were being routed through DFG's legal department because of DWR's written statements about the questionable dam integrity. He feared potential legal ramifications relating to the dam that lies on DFG land. However, he discussed some issues that should be addressed in the final report, including the probability of less injury to fish spilling over a 4-ft. high dam compared to a 15-ft. high dam. He also stressed that if the dam were to fail after implementing Alternative 3 (the south bank fish ladder at

the existing dam site), the new ladder would be a stranded investment. He also said that DFG will want assistance from DWR to evaluate the level of liability, exposure, etc. that DFG presently has with the existing dam.

Mr. Hubatka pointed out that Mr. Schmitt owns the material that will be excavated from behind Saeltzer Dam, thus a paragraph regarding re-use of materials will be eliminated from the report. Another comment was that if the existing dam is removed, and the diversion moved upstream, the expected gravel degradation may affect the downstream channel restoration work.

Mr. Brown asked if the environmental site surveys included areas upstream of the Alternative 1 project area. The surveys only included the areas shown on Figure 3 of the report because moving the point of diversion further upstream than the Alternative 1 site was not an alternative being evaluated at the time of the surveys. DWR had been asked to focus on the Alternative 1 site because that was TFWDC's preferred new diversion dam site. When an Alternative is selected for construction, more detailed surveys will be conducted in the appropriate areas.

3. The CalFed proposal by Mr. Braithwaite, for TFWDC, has been selected for funding of the design portion of the project. No funds have been encumbered to date. Mr. Braithwaite said he will need to obtain insurance, get sub-contractors lined up, meet with the design team, and draft a management procedures memo prior to meeting with CalFed.

4. A Work Plan has not been drafted yet, but the following summarizes the status.

Since DWR determined that the depth to bedrock is up to 20 feet at the Alternative 1 dam site, Mr. Braithwaite is considering a sheet pile dam structure, if that site is to be used. However, because of the concerns about degradation at the Alternative 1 dam site, Mr. Braithwaite now wants to design an open side-channel diversion about 3000 feet upstream of the Alternative 1 site. This option would not require an in-stream diversion structure, thus no fish ladder would be constructed. He said the design could tolerate up to 4 feet of channel degradation at the diversion. If the channel degraded more than 4 feet, large boulders could be placed in the channel to raise the water surface elevation enough to allow for diversion of TFWDC's 55cfs water right.

Mr. Braithwaite has met at the project site with a structural engineer and a construction firm to discuss pipeline constructability issues. Mr. Braithwaite now wants to design a north bank pipeline because a protected pipeline would be cheaper than a south bank pipeline and creek crossing. Also, the potential

liability would probably be lessened without the crossing.

5. Mr. Braithwaite's schedule calls for 60 weeks, or possibly 52 weeks at best, to complete bid-ready documents. Therefore he must start design work in March, 1998 for construction to begin in 1999.

Mr. Braithwaite thinks the best funding option is to have BOR fund DWR for our future surveying and exploration work, and have CalFed fund the consultants.

Mr. Braithwaite plans to decide within six weeks which option to go with, then North State Resources can start environmental work. Then Mr. Braithwaite will lay out a plan, including maintenance, and present it to TFWDC.

Mr. Braithwaite has asked DWR to perform the following work in the final design phase of the project:

- Topographic survey of the diversion site (either the Alternative 1 site or the side channel diversion site) and pipeline alignment. He wants DWR to survey at least enough to verify accuracy of Enplan's orthophoto topographic map which shows 2-foot contours.

- Geologic exploration at the steep corner along the left bank, about 500 to 900 feet upstream of Saeltzer Dam.

- Fish screen design - Mr. Braithwaite would locate anchors, Mark Cram (The^2 Engineering Company) would perform structural calculations, then DWR would complete final designs, showing details of everything needed for screen.

- Fish ladder design (if the Alternative 1 diversion dam site is pursued).

Designs will be reviewed by DFG and NMFS.

The design team will consist of two groups; 1) Mr. Braithwaite, North State Resources, The^2 Engineering Company, and DWR, and 2) a committee consisting of a representative of each concerned agency and the contractor representative.

Mr. Braithwaite will call a meeting soon to 1) identify assurances necessary to satisfy TFWDC, and 2) determine if the dam stays or goes.

DWR has the following concerns about the "new" project:

- Mr. Braithwaite's statement that he has not yet presented TFWDC with his proposed side channel diversion idea raises the following questions:

  1) Is TFWDC aware of the added maintenance that could be required because of A) deposition in the mouth of the diversion channel, and B) potential degradation in the creek channel?

  2) Is TFWDC apprised of the potential increased susceptibility to flood damages?

  3) Will TFWDC accept the increased maintenance responsibilities?

- Channel degradation could create a fish passage barrier or obstacle at the new site.

- DWR opinion is that the Alternative 1a site (4600 feet upstream of the Alternative 1 site) would be a better diversion point than the side channel site (3000 feet upstream of the Alternative 1 site) because the exposed bedrock in the channel at the 1a site could provide control for a side channel diversion, or a good base for a low head dam. However, Mr. Braithwaite indicated that the Alternative 1a site was eliminated because 1) it lies on private property, 2) more material would have to be excavated for pipeline construction, and 3) floodplain modifications would be greater, thus FEMA and/or Reclamation Board standards could be harder to comply with at the 1a site.

Filename: NOTES129.98

Appendix D

Hydrological Data

Clear Creek near Igo Historical Flows

The Clear Creek near Igo gaging station (11372000) is operated by the USGS and located approximately 4 miles upstream of Saeltzer Dam. Average daily flows for Clear Creek near Igo were looked at for the period of October 1, 1963 to September 30, 1996. This represents 33 complete water years since the construction and operation of Whiskeytown Dam.

Monthly exceedances were calculated first by using the entire flow record. All the daily flows for the 33-year period were sorted in a descending order and exceedances for 90%, 50%, 33%, 20%, 10%, and 5% were calculated. Next, the 3-day delay flows for each month was determined for the 33-year period. These flows were then sorted in a descending order and exceedances calculated as before. The exceedances are shown in Table D1.

A 3-day delay flow frequency analysis was then performed with the data from the 33 water years mentioned above. Three separate time periods were looked at in the analysis. A 3-day delay discharge was obtained for each of the 33 water years for the three time periods. First, 3-day delay discharges were obtained for the entire water year. Next, 3-day delay discharges were obtained for the March 1 to July 31 period. The 3-day delay discharges were then obtained for the March 15 to July 31 period. The sets of 33 discharges for each time period were then sorted in a descending order and ranked. The return periods for these flows were then calculated and are shown in Table D2. Frequency curves were constructed for each of the three time periods and are shown in Figures D1, D2, and D3.

A relative frequency analysis was also performed based on yearly maximum average daily discharges. The 23-year period pre-Whiskeytown Dam and 33-year period post-Whiskeytown Dam were used in the analysis. The relative frequencies for the 2000 cfs flow intervals are shown in Table D3 for the two time periods. A histogram of the relative frequencies is shown in Figure D4.

Table D1

Clear Creek near Igo Average Daily Flow (cfs)-Water Years 1964 to 1996

Exceedance	January	February	March	April	May	June	July	August	September	October	November	December
90%	54	62	67	64	55	51	47	47	46	47	86	95
50%	103	127	141	92	69	59	53	51	52	54	105	114
33%	169	201	200	123	78	62	55	53	54	56	115	150
20%	295	358	309	159	92	68	58	54	55	59	154	217
10%	738	774	602	219	116	83	65	59	58	99	250	359
5%	1130	1110	1150	305	148	94	75	66	65	173	507	795

Clear Creek near Igo 3-Day Delay Average Daily Flow (cfs)-Water Years 1964 to 1996

Exceedance	January	February	March	April	May	June	July	August	September	October	November	December
90%	88	76	86	77	63	53	50	48	47	50	98	107
50%	374	309	337	137	82	63	56	53	55	57	121	189
33%	524	527	397	166	109	68	58	54	56	60	195	289
20%	956	740	575	240	139	81	71	55	58	87	310	359
10%	3107	1261	1647	513	251	112	80	65	67	134	541	953
5%	3766	1740	5216	2354	583	474	201	77	82	825	858	1781

Notes:

Average Daily Discharges from USGS Station Number 11372000-Clear Creek near Igo.

The 3-day delay discharge is the largest discharge value which is equalled or exceeded three times in three consecutive days over a given period.

Table D2

Clear Creek near Igo 3-Day Delay Average Daily Discharges-1964 to 1996

Rank	Water Year Q3 (cfs)	Return Period (years)	Rank	3/1-7/31 Q3 (cfs)	Return Period (years)	Rank	3/15-7/31 Q3 (cfs)	Return Period (years)
1	11300	34.00	1	11300	34.00	1	3420	34.00
2	6200	17.50	2	3420	17.50	2	2740	17.50
3	3980	12.00	3	1830	12.00	3	1830	12.00
4	3650	9.25	4	1220	9.25	4	1140	9.25
5	2680	7.60	5	1140	7.60	5	1130	7.60
6	2600	6.50	6	1040	6.50	6	1040	6.50
7	1740	5.71	7	636	5.71	7	636	5.71
8	1390	5.13	8	541	5.13	8	541	5.13
9	1270	4.67	9	534	4.67	9	446	4.67
10	1220	4.30	10	466	4.30	10	403	4.30
11	1140	4.00	11	446	4.00	11	393	4.00
12	938	3.75	12	429	3.75	12	360	3.75
13	877	3.54	13	393	3.54	13	351	3.54
14	648	3.36	14	391	3.36	14	350	3.36
15	636	3.20	15	360	3.20	15	306	3.20
16	580	3.06	16	351	3.06	16	292	3.06
17	555	2.94	17	350	2.94	17	285	2.94
18	545	2.83	18	348	2.83	18	265	2.83
19	525	2.74	19	333	2.74	19	262	2.74
20	522	2.65	20	328	2.65	20	255	2.65
21	476	2.57	21	315	2.57	21	217	2.57
22	391	2.50	22	285	2.50	22	192	2.50
23	389	2.43	23	262	2.43	23	174	2.43
24	373	2.38	24	255	2.38	24	167	2.38
25	348	2.32	25	217	2.32	25	163	2.32
26	302	2.27	26	192	2.27	26	157	2.27
27	301	2.22	27	174	2.22	27	148	2.22
28	265	2.18	28	156	2.18	28	134	2.18
29	192	2.14	29	145	2.14	29	131	2.14
30	179	2.10	30	131	2.10	30	118	2.10
31	174	2.06	31	118	2.06	31	113	2.06
32	156	2.03	32	84	2.03	32	84	2.03
33	104	2.00	33	70	2.00	33	70	2.00

Notes:

Average Daily Discharges were used from USGS Station Number 11372000-Clear Creek near Igo.

The 3-day delay discharge is the largest discharge value which is equalled or exceeded three times in three consecutive days over a given period.

Figure D1

Clear Creek near Igo Frequency Curve-October 1 to September 30 (1963-1996)

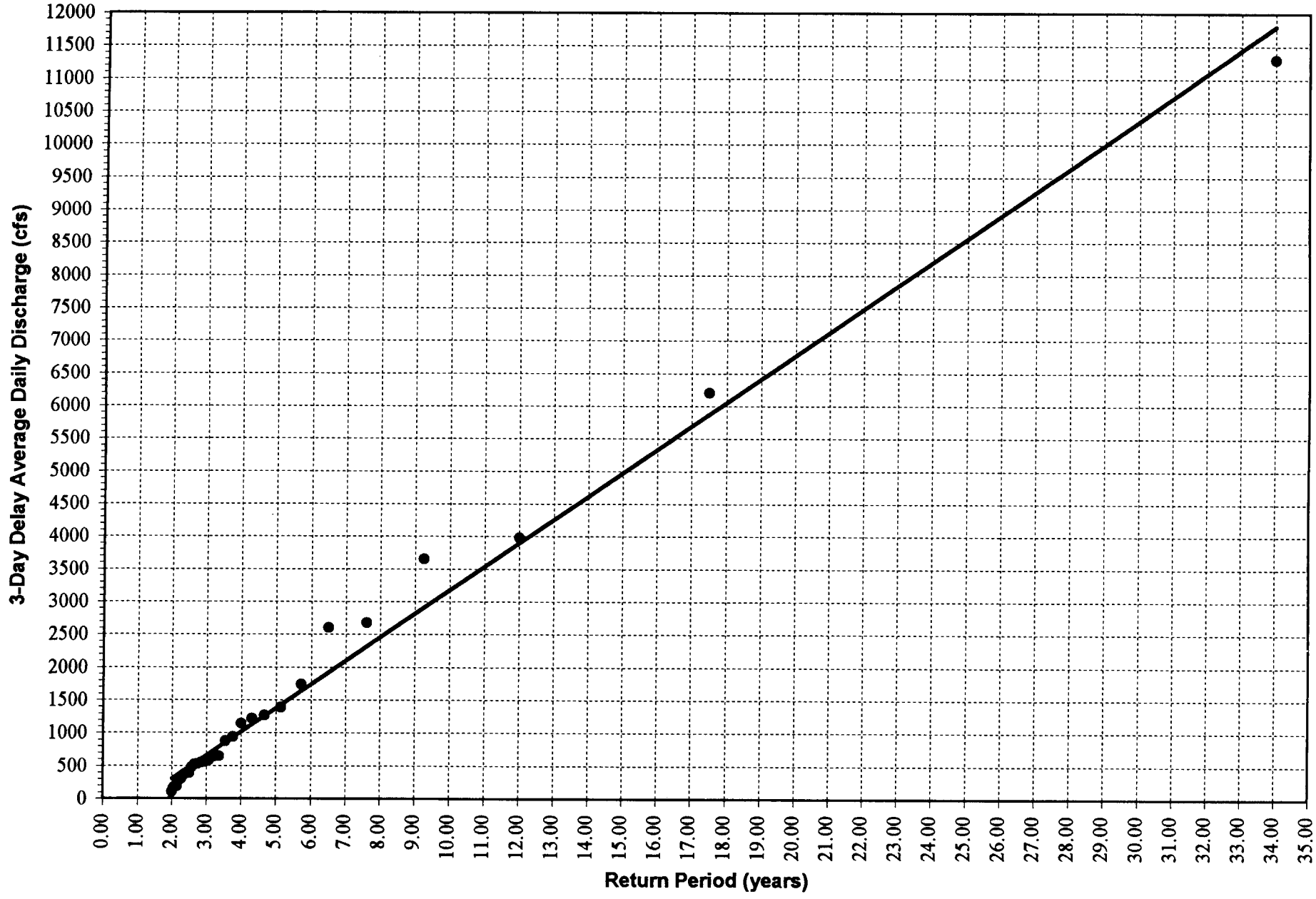


Figure D2

Clear Creek near Igo Frequency Curve-March 1 to July 31 (1964-1996)

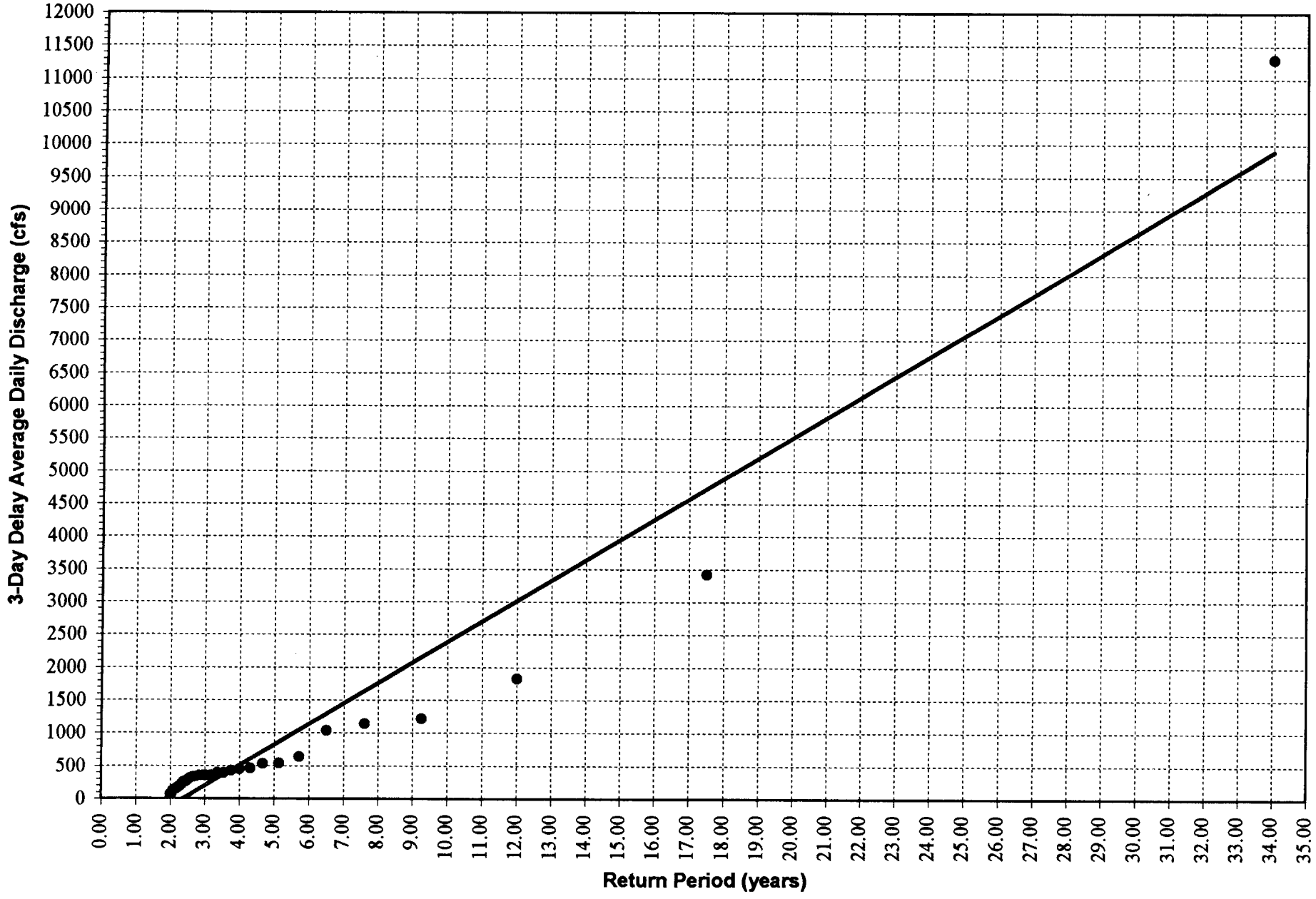
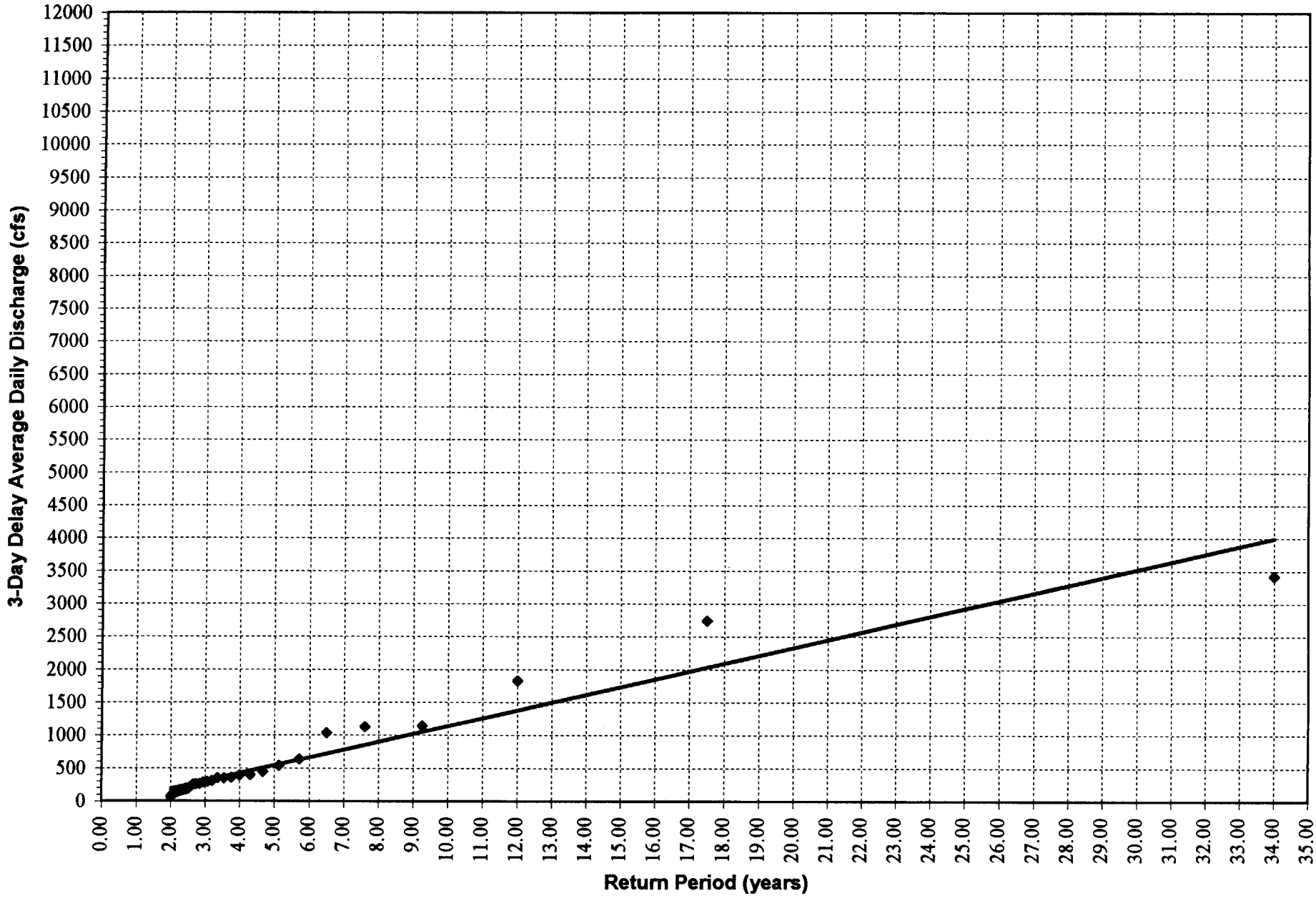


Figure D3

Clear Creek near Igo Frequency Curve-March 15 to July 31 (1964-1996)



Clear Creek near Igo Relative Frequency Computations

(Yearly Maximum Average Daily Discharge)

Pre-Whiskeytown Dam (23 water years)

Flow Interval (cfs)	Interval Mean (cfs)	Frequency	Relative Frequency
0-2000	1000	1	0.04
2000-4000	3000	8	0.35
4000-6000	5000	3	0.13
6000-8000	7000	5	0.22
8000-10000	9000	3	0.13
10000-12000	11000	0	0.00
12000-14000	13000	0	0.00
14000-16000	15000	3	0.13
		23	1.00

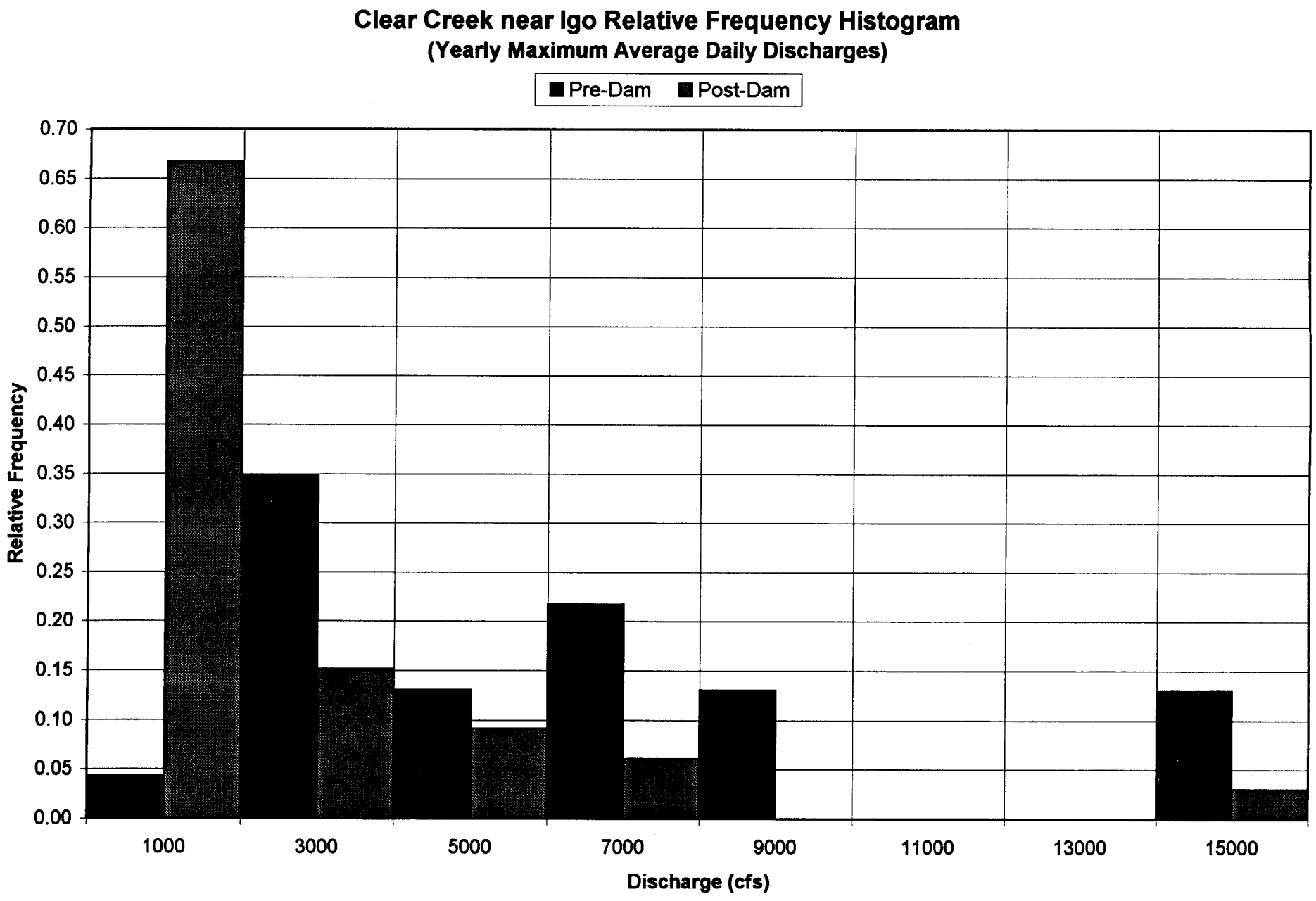
Post-Whiskeytown Dam (33 water years)

Flow Interval (cfs)	Interval Mean (cfs)	Frequency	Relative Frequency
0-2000	1000	22	0.67
2000-4000	3000	5	0.15
4000-6000	5000	3	0.09
6000-8000	7000	2	0.06
8000-10000	9000	0	0.00
10000-12000	11000	0	0.00
12000-14000	13000	0	0.00
14000-16000	15000	1	0.03
		33	1.00

Note:

Yearly Maximum Average Daily Discharges from USGS Station Number 11372000-Clear Creek near Igo. Relative frequency represents the probability of a flow occuring within the flow interval based upon the maximum annual average daily discharge for the time periods specified.

Figure D4


Clear Creek near Igo Relative Frequency Histogram
(Yearly Maximum Average Daily Discharges)
Pre-Dam
Post-Dam
Relative Frequency
0.70
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1000
3000
5000
7000
9000
11000
13000
15000
Discharge (cfs)

Appendix E

Archaeological Report

A CULTURAL RESOURCES SURVEY FOR THE SAELTZER DAM FISH PASSAGE PROJECT CLEAR CREEK, SHASTA COUNTY, CALIFORNIA

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FOR
DEPARTMENT OF WATER RESOURCES
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APRIL 7, 1998

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INTRODUCTION

The Department of Water Resources (DWR) is considering alternatives to restore the salmonid fishery habitat on lower Clear Creek in Shasta County, California. The importance of Clear Creek to anadromous fishery is largely due to its influence on the Sacramento River fishery. The primary causes of the reductions in the salmonid population are due to loss and degradation of spawning gravels, reduced flows caused by Whiskeytown Dam and water diversions, and the blockage of fish passage at Saeltzer Dam (DWR: 1986:23). The proposed project addresses the latter issue: to find a solution to the fish passage problem at Saeltzer Dam.

An archaeological survey has been completed for the project, since it has the potential to adversely effect prehistoric and historic cultural resources that may be present. The results of the survey, consisting of a record search and a field reconnaissance, are documented herein.

PROJECT DESCRIPTION

Clear Creek is the first major tributary to the Sacramento River below Whiskeytown Dam. The creek is relatively unusual in that the majority of its fishery improvement potential lies in the lower eight miles, where streamflow is almost totally controlled by Whiskeytown Dam located at mile 16.5. Chinook salmon spawn heavily in the lower six miles of Clear Creek during years when early fall rain provides suitable attraction flows. Saeltzer Dam at mile 6 presently blocks all anadromous fish from the 10 miles of stream between Saeltzer and Whiskeytown dams. There are two miles of good salmonid spawning habitat immediately above Saeltzer Dam and eight miles of rearing habitat above that. The Clear Creek fishery could be substantially improved once suitable fish passage is provided.

Over the years, fish passage structures have been constructed around the dam; however, none have been successful. The existing one, a tunnel fish ladder constructed in 1958, proved unsuccessful in providing fish passage around the dam; it is presently inoperable. Operational problems were due to the frequency with which the upstream entry was blocked by accumulated sediment, the position of the downstream entrance in a low velocity backwater, the darkness of the tunnel, and the maintenance problems due to limited access and hazardous conditions (DWR 1986:30).

At this time, a definite plan for improving fish passage has not been approved; however, several options are being considered. One alternative consists of removing the existing dam and constructing a lower diversion dam approximately 2000 feet upstream of the existing dam with a bypass pipeline to the existing headworks structure. A new fishway and screen would be built at the new dam site. Other alternatives consist of removing the existing dam and reconstructing a new one at the same location with a new fishway, and constructing a new fishway around the south side of the existing dam.

Whichever alternative is selected, it will potentially include work to improve fish passage through the steep gorge that begins about 130 feet downstream of the dam and drops about 25 feet in elevation through a series of falls and rapids over the next 200 feet. The work would include blasting large boulders and bedrock configurations that impede fish passage.

ENVIRONMENTAL SETTING

Clear Creek, with a basin of 238 square miles, is a major westside tributary of the Sacramento River. It originates in the mountains east of Trinity Lake, approximately 35 miles from its confluence with the Sacramento River, and joins with it near the South Redding city limits. All of the Trinity River water and 87 percent of the natural flows of Clear Creek are diverted through the Spring Creek Tunnel to the Sacramento River above Keswick Dam, at Whiskeytown Lake. The remaining 13 percent flow is released to Clear Creek.

The terrain of Clear Creek can be differentiated into two predominant types at the Clear Creek Road Bridge, just below mile 8.0. Upstream, the creek cuts through steep canyon walls and has many falls and cascades. The creek bottom is mostly large rock and decomposed granitic sand. Below the bridge, the stream has a flatter gradient with few cascades or falls, and the streambed is mostly gravel mixed with sand. Most of the suitable fish spawning and rearing gravel are in this reach (DWR 1986:6).

Saeltzer Dam was built in a locale where the canyon walls converge along Clear Creek. A gorge with near-vertical rock walls up to 50 feet high begins just downstream of the dam. Bedrock in the project area is hard granitic rock. Recent alluvium, made up of sand, cobbles, and boulders, is in the active stream channel and locally overlying bedrock above the active channel.

Upslope of the alluvium the soils are the reddish iron-rich soils typical of the foothills. They support a blue oak-foothill pine association with a manzanita and buckbrush understory. Between the dam and the proposed new dam site, 2000 feet upstream, oaks provide the tree cover, with locally dense riparian thickets of willow, blackberry, and wild grape.

CULTURAL SETTING

The following summary is excerpted from La Pena (1978). At the time of contact with the first Europeans, lower Clear Creek was the homeland of the Keswick group of the Wintu, the indigenous people whose territory covered parts of what are now Trinity, Shasta, Siskiyou, and Tehama counties on both sides of the Sacramento River. Their lands extended from the flanks of Mt. Shasta on the north to about six miles south of Cottonwood Creek on the south. On the west, they went as far as the South Fork Trinity River and on the east to the vicinity of Cow Creek and the divide between Stillwater Creek and the Pit River.

A Wintu village usually consisted of 20-150 people who lived in conical bark houses. Larger villages had a large semi-subterranean assembly and ceremonial structure. A domed brush shelter served as a sweat-house and menstrual hut. The village was considered the primary social, political, and economic unit. Leadership was hereditary from father to eldest son, but only if his suitability was acceptable to the group.

Subsistence was based on hunting, gathering, and fishing. Deer and brown bear were the most important big game while small game such as rabbits, quail, gophers and other small rodents constituted the daily mainstays. The men and boys did the hunting, usually as a communal event. Procuring vegetable foods was the responsibility of the women and was carried out by the family or local group. As in all areas of California where oaks are present, acorns were the staple food. They were ground into a flour with stone implements, leached of their bitter tannic acids with water in sand basins, and prepared into soup by stone-boiling and baked into bread in rock-lined earth ovens. Also important were buckeye, pine nuts, manzanita berries, and a great variety of smaller plants that provided edible bulbs, roots, and corms, fresh greens, and seeds.

Chinook salmon and steelhead were taken from the larger streams and rivers; suckers, trout, and whitefish were also caught. Fishing was done communally with dip nets and with nets strong across openings in rock and brush weirs that were built out from each bank. Individual fishing was done with harpoons and with fishhooks of thorns or deer bone strung on plant fiber line. Fish poisons, such as pounded soaproot, were also used where isolated pools could be found or created with a rough stone dam.

Important commodities such as salt, obsidian, and marine shell beads not found in Wintu territory were traded for with their neighbors for deer hides, woodpecker scalps, seeds, and acorns.

The first contact the Wintu had with Euro-Americans was with the Jedediah Smith and Peter Ogden expeditions of 1826 and 1827. A malaria epidemic introduced by trappers from Oregon between 1830-1833 took 75 percent of the native population of the central and upper Sacramento Valley. In 1846, the Mexican land grant to Pearson Reading, in the upper Sacramento Valley, led to settlers moving in with their cattle and sheep, effectively resulting in the destruction of much of the Wintu subsistence base. After gold was discovered their resources were further depleted by the miners preemption and pollution of the fishing streams and around the turn of the century, copper processing plants led to the destruction of large groves of trees and much natural vegetation.

By the turn of the century, the continuing development of agriculture and mining associated with the growth of Redding as an urban center, resulted in the construction of Saeltzer Dam. It was built in 1903, to divert water through the Townsend Flat Water Ditch for mining and irrigation purposes.

Out of an estimated pre-contact population estimate of 14,250 Wintu, there were about 400 remaining by the turn of the century. In 1971, 900 persons identified themselves as Wintu. Their lives were again disrupted in the 1970s by three reservoir projects in the upper Sacramento and McCloud basins, which had the last large concentrations of Wintu people.

SURVEY METHODS

RECORD SEARCH

Base maps, site records, report files, and federal and state listings of significant cultural resources were reviewed at the Northeast Information Center at California State University, Chico. Although parts of the project area had been previously surveyed, no known prehistoric or historic sites were identified within the boundaries of the proposed project (see Appendix B).

FIELD RECONNAISSANCE

The field survey was carried out by the writer on November 7, 1997, accompanied by Kevin Dossey, Associate Engineer and John Elko, Engineering Associate, Department of Water Resources, Northern District. The project area consisted of Saeltzer Dam, the non-operational fish ladder, staging areas near the dam abutments, a proposed new dam site approximately 2000 feet upstream of Saeltzer Dam, the route of a proposed pipeline along the south bank of Clear Creek between the new dam site and Saeltzer Dam, and the access roads to Saeltzer Dam from China Gulch Drive and Clear Creek Road. The project lands are owned by the State of California, Department of Fish and Game (DFG) and by the U.S. Department of the Interior, Bureau of Land Management (BLM). The access road from China Gulch Drive runs through private parcel easements and DFG and BLM lands.

The access road to the north dam embankment is on the south side of Clear Creek Road approximately 600 feet west of the turnoff to Honey Bee Road. The south dam embankment is reached by a jeep trail that starts at BM 814 on the Section Line between Section 5 and Section 6, west of China Gulch Drive.

The dam is a concrete structure ranging from 3 feet to approximately 24 feet high and 250 feet long. The crest is about one foot wide and trends N10°E across the creek. The Townsend Flat Water Ditch diversion and appurtenances are located in the north abutment of the dam. The dam abutments are tied to the granitic bedrock exposed on the south abutment and downstream of the dam. Elevation at the dam is 540 feet.

The project area is about 2000 feet long and between 400-800 feet wide across the creek. The jeep trail that provides access to the south abutment is about three-quarters of a mile long. The access road from Clear Creek Road to the north dam abutment is approximately 200 feet long.

In 1958, a fish ladder tunnel approximately 375 feet long was constructed in the south abutment. The downstream portal is about 330 feet from the dam at stream level. The upstream opening is a cut-and-cover box structure approximately 45 feet long and terminates about 30 feet upstream of the dam. The south wall is *in situ* bedrock and the north wall and roof are concrete. The dam and appurtenances are a total fish barrier; the fish passage structure was never successful and is now sealed off.

The field survey consisted of a general reconnaissance. Other than localized areas of dense riparian vegetation, the project area was accessible for inspection. Ground visibility was otherwise generally good to excellent. Rodent burrow backdirt was examined and a trowel was used to spot check soils. Accessible rock surfaces were inspected for rock art and for grinding and milling features such as slicks and bedrock mortars.

SURVEY FINDINGS

The result of the record search was negative for the proposed project area. Sections of the project area had been surveyed in the past and other than the evidence of historic gold mining activity, no cultural resources were found. This activity, noted during the current survey, consisted of hummocky areas, tailings piles, excavations, and washed out areas along some of the rock faces. These mined areas occur along the streams and rivers throughout the region. Those within the project area do not constitute a distinct and coherent enough activity area to warrant recordation as an historic archaeological site.

No indications of prehistoric features or sites were noted by previous surveys. The potential for finding evidence of prehistoric cultural resources is very low. Those areas that were not disturbed by gold mining were covered with alluvial sand and gravel; the banks in the project area would have been overtopped and frequently flooded during high winter flows.

The physical condition of the dam has been judged to be very poor by DWR engineers. The concrete shows extensive deterioration and cracking and there is evidence of many concrete repairs. Water flows into the dam into several locations via cracks and openings along the crest, and out of the dam through construction joints, cracks, and seepage paths beneath the dam (Glick 1997). Both embankments have been modified many times over the years; on the north side for facilities related to the diversion and on the south side for fish passage structures.

The dam and diversion do have a minor degree of significance related to the development of the South Redding area, but the structure itself has no importance as a representative of innovative construction methods or as a significant engineering feature. As noted above, its condition and integrity is poor to questionable. For the purpose of the proposed project, Saeltzer Dam is documented by the Primary Record in Appendix A, and no further work is warranted at this time.

REFERENCES CITED

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1986 Clear Creek Fishery Study. Northern District, Red Bluff.

La Pena, Frank R.
1978 Wintu. In: Handbook of North American Indians, Vol. 8, Robert F. Heizer, ed., pp. 324-340. Washington: Smithsonian Institution.

Glick, Frank L.
1997 Memorandum: Saeltzer Dam, Proposed Fish Ladder; Results of Geologic Inspection. Department of Water Resources, Division of Engineering, Project Geology Section.

APPENDIX A

SAELTZER DAM
PRIMARY RECORD

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code
Other Listings
Review Code Reviewer Date

Page 1 of 7 *Resource Name or #: (Assigned by recorder) Saeltzer Dam

P1. Other Identifier:

*P2. Location: ☐ Not for Publication ☒ Unrestricted *a. County Shasta

and (P2b and P2c or P2d. Attach a Location Map as necessary.)

*b. USGS 7.5' Quad Olinda Date 1964 T 31N R5W ; NE ¼ of SE ¼ of Sec 31 ; M.D.B.M.

c. Address Clear Creek, Mile 6 City n.a. Zip n.a.

d. UTM: (Give more than one for large and/or linear resources) Zone 10 ; 544930 mE/ 4482430 mN

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate) From the south, take I5 north to State Highway 273 to Anderson. Go through Anderson 7.5 mi. NW to Clear Creek Rd. Take Clear Cr. Rd. approx. 5 mi. west to dirt access road on

*P3a. Description: (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

Saeltzer Dam was built in 1903 at mile 6.0 on Clear Creek to divert water through the Townsend Flat Water Ditch for mining and irrigation purposes southwest of Redding. The ditch is the only large water diversion below Whiskeytown Dam. The diversion irrigates approx. 200 acres of land north of the creek in the summer (18cfs), up to 1 cfs at a ranch at mile 4.7, minor amounts for garden irrigation along the lower 2 miles, and occasionally for washing gravel at the B&S Gravel Plant.

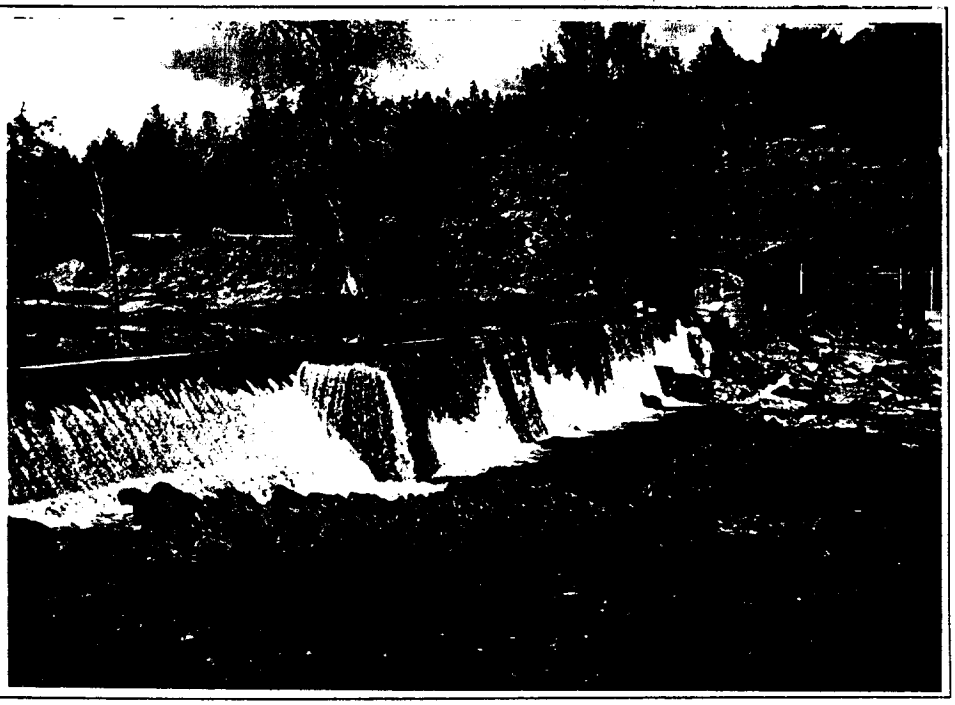
The dam is on the south side of Clear Creek Road, southwest of Redding. It is a concrete structure ranging from 3 feet to approx. 24 feet high and 250 feet long. The crest is about one foot wide and trends approx. N10°E across the creek. Granitic bedrock is exposed on the south abutment and downstream of the dam.

In 1958 a fish ladder tunnel approx. 375' long was constructed in the south abutment. The downstream portal is ca. 330 feet from the dam at stream level. The upstream portal is a cut-and-cover box structure approx. 45 feet long and terminates ca. 30 feet upstream of the dam. The south wall is in situ bedrock and the north wall and

*P3b. Resource Attributes: (List attributes and codes) HP 21 Dam

*P4. Resources Present: ☐Building ☒Structure ☐Object ☐Site ☐District ☐Element of District ☐Other (Isolates, etc.)

P5a.



P5b. Description of Photo: (View, date, accession #) View NNW of Saeltzer Dam, 11-7-97

*P6. Date Constructed/Age and Sources: ☒Historic ☐Prehistoric ☐Both
1903. Dept. of Water Resources, N. Dist.

*P7. Owner and Address:
Dept. of Fish & Game 601 Locust St., Redding, CA 96001 & Dept. of the

*P8. Recorded by: (Name, affiliation, and address) Robert I. Orlins, Dept. of Water Resources, Environ. Serv. Office, 3251 S St.,

*P9. Date Recorded: 11-7-97

*P10. Survey Type: (Describe)
Reconnaissance Survey

*P11. Report Citation: (Cite survey report and other sources, or enter "none.") A Cultural Resources Survey for the Saeltzer Dam Fish Passage Project, Clear Creek, Shasta County, California. Robert I.

*Attachments: NONE ☒Location Map ☒Sketch Map ☒Continuation Sheet ☐Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List)

DPR 523A (1/95) *Required information

P2e.
south side of Clear Cr. Rd. The access road is ca. 600 ft. west of the turnoff to Honey Bee Rd. This route provides access to the north dam embankment.

To the south dam embankment, take State Highway 273 ca. 5 mi., passing through Anderson, northwest to Happy Valley Rd. Take Happy Valley rd. southwest ca. a quarter mi. to Hawthorne Ave. Go west on Hawthorne ca. 3 mi. to China Gulch Dr. Head north on China Gulch Rd. ca. .5 mi. to dirt road in 90 degree bend to east. Take dirt road ca. .5 mi. west to BM 814. Go south through gated jeep trail ca. .75 mi. downslope to south dam abutment.

Elevation is 540 ft. asl.

P3a.
roof are concrete. The fish passage structure is now sealed off. It was never successful; the structures are a total fish barrier (Department of Water Resources 1986).

The area in the vicinity of the dam has been mined for gold, evidenced by hummocky areas, tailings piles, excavations, and gravelly washed out areas. It is subject to heavy public recreation use, especially fishing, and picnicing, swimming, and tubing in the summer.

The physical condition of the dam is very poor. The concrete shows extensive deterioration and cracking. There is evidence of many concrete repairs. Water flows into the dam in several locations via cracks and openings along the crest and out of the dam through construction joints, cracks, and seepage paths beneath the dam (Mendenhall 1997).

P7.

Interior, Bureau of Land Management,355 Hemsted Drive, Redding, California 96002.

P8.

Sacramento, California 95816-7017.

P11.

Orlins (April 1998).

References Cited (P3a)

Department of Water Resources
1986 Clear Creek Fishery Study. Northern District, Red Bluff.

Glick, Frank L.
1997 Memorandum to Bill Mendenhall (July 11) on Saeltzer Dam, Proposed Fish Ladder, Results of Geologic Inspection. Department of Water Resources, Division of Engineering, Project Geology Section.

a. View upstream of Saeltzer Dam.

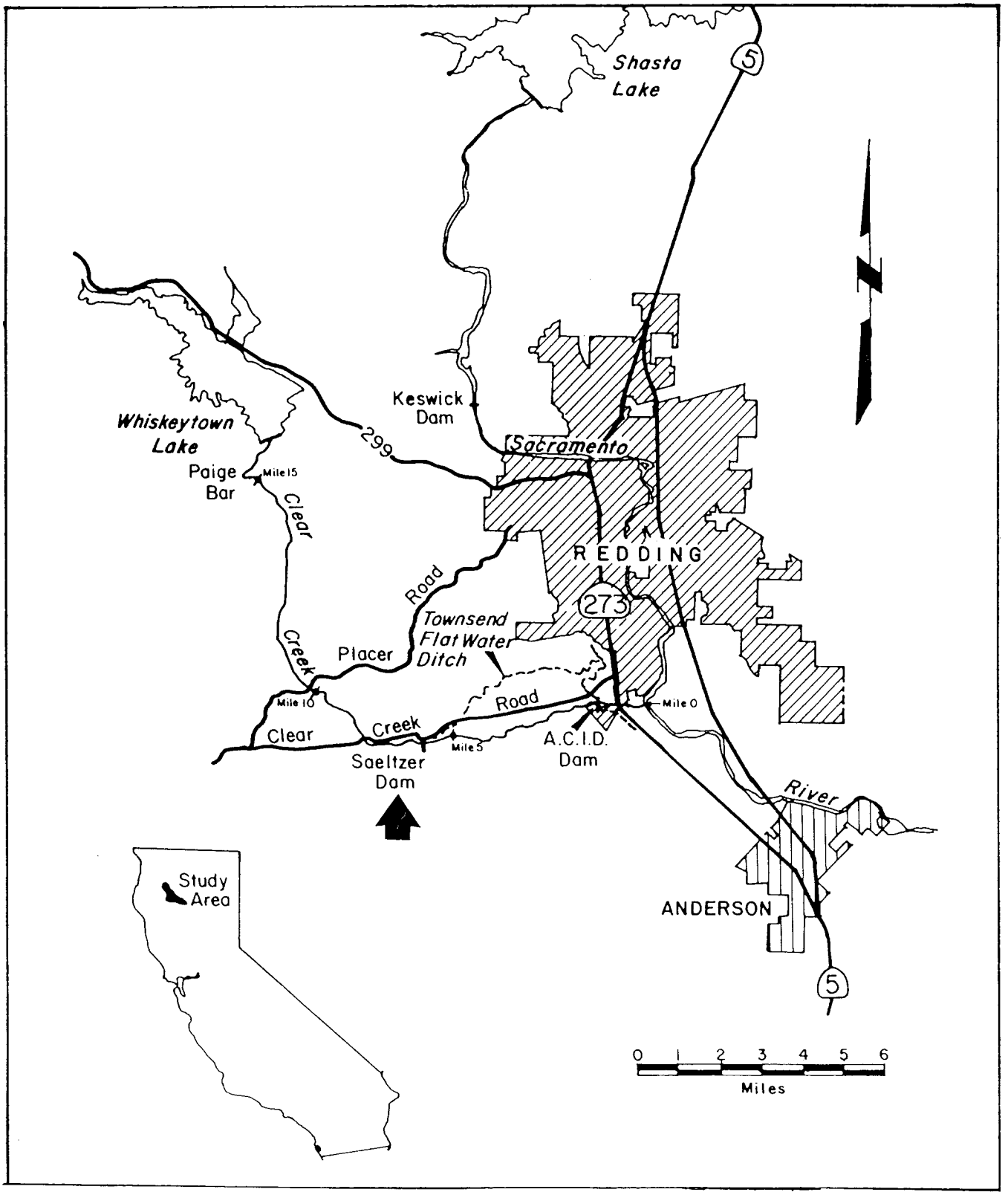
b. View west of nonoperational fish ladder.

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary #
HRI#
Trinomial

Page 4 of 7 *Resource Name or # (Assigned by recorder) Saeltzer Dam

*Map Name: Location of Study Area *Scale: *Date of Map: 1986



DPR 523J (1/95)

*Required information

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

LOCATION MAP

Primary #
HRI#
Trinomial

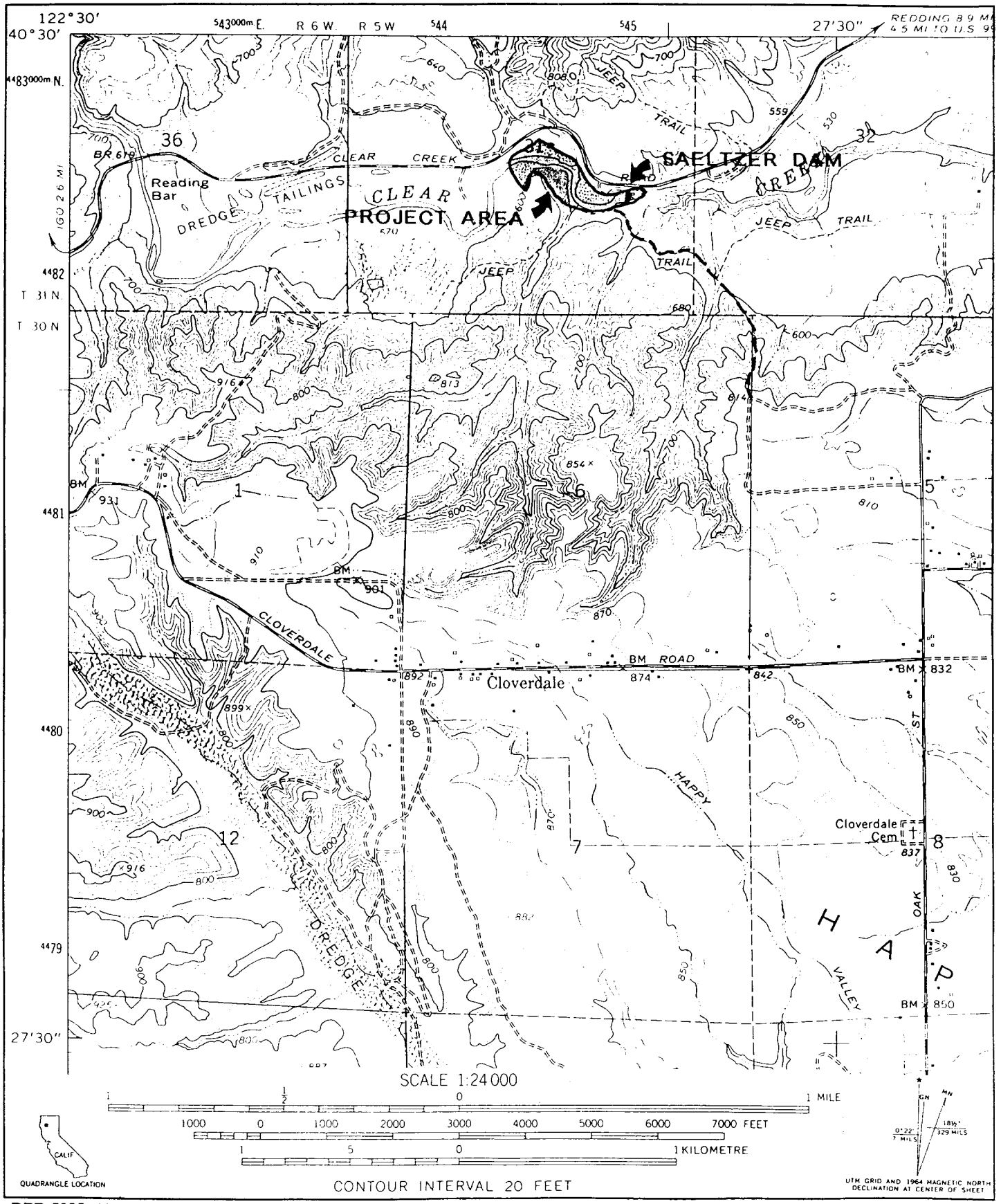
Page 5 of 7

*Resource Name or # (Assigned by recorder) Saeltzer Dam

*Map Name: Olinda 7.5'

*Scale: 1:24000

*Date of Map: 1964



DPR 523J (1/95)

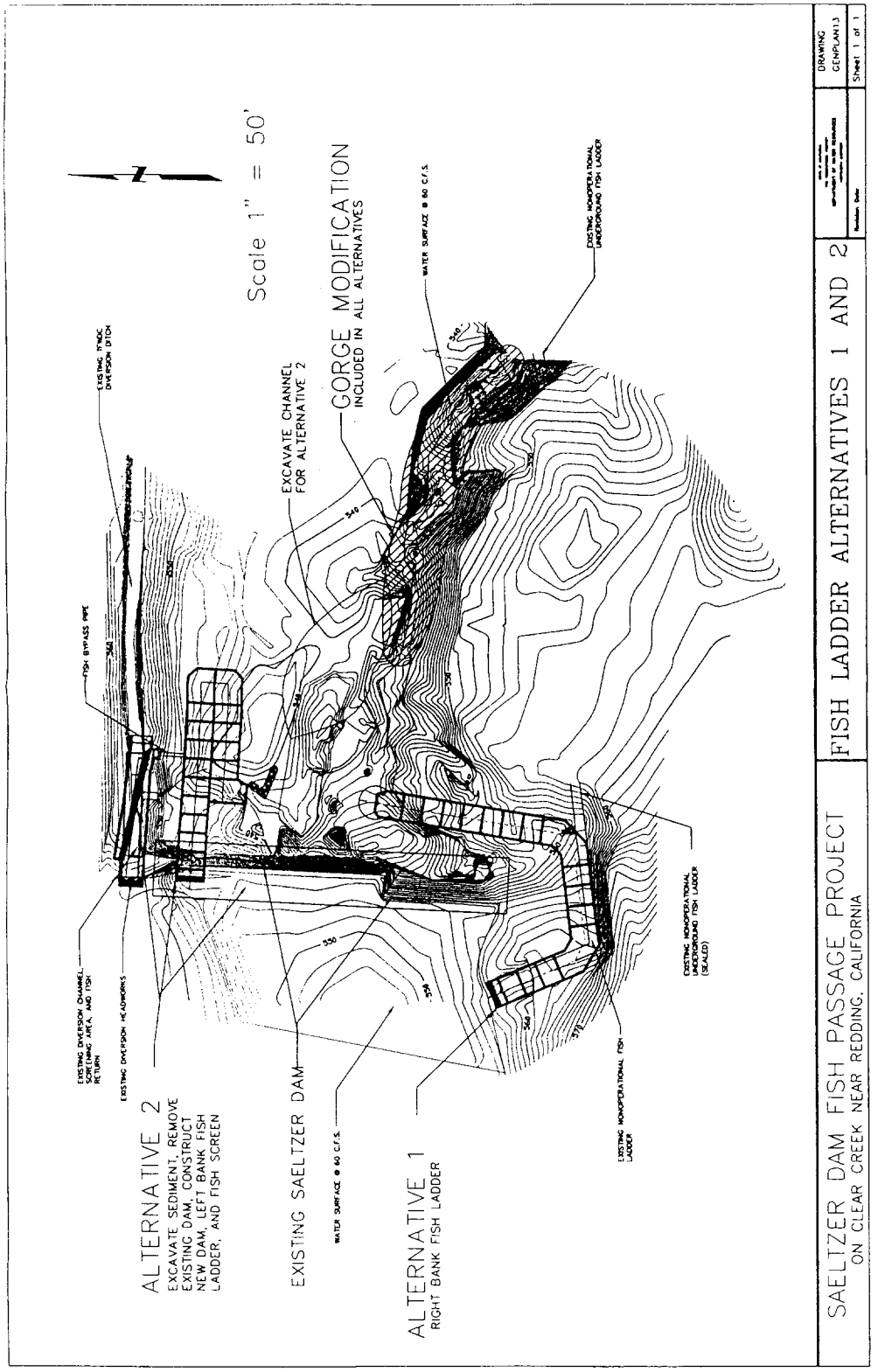
*Required information

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
SKETCH MAP

Primary #
HRI#
Trinomial

Page 6 of 7 *Resource Name or # (Assigned by recorder) Saeltzer Dam

*Drawn By: Dept. of Water Resources *Date: 1987



NOTE: Include bar scale and north arrow.

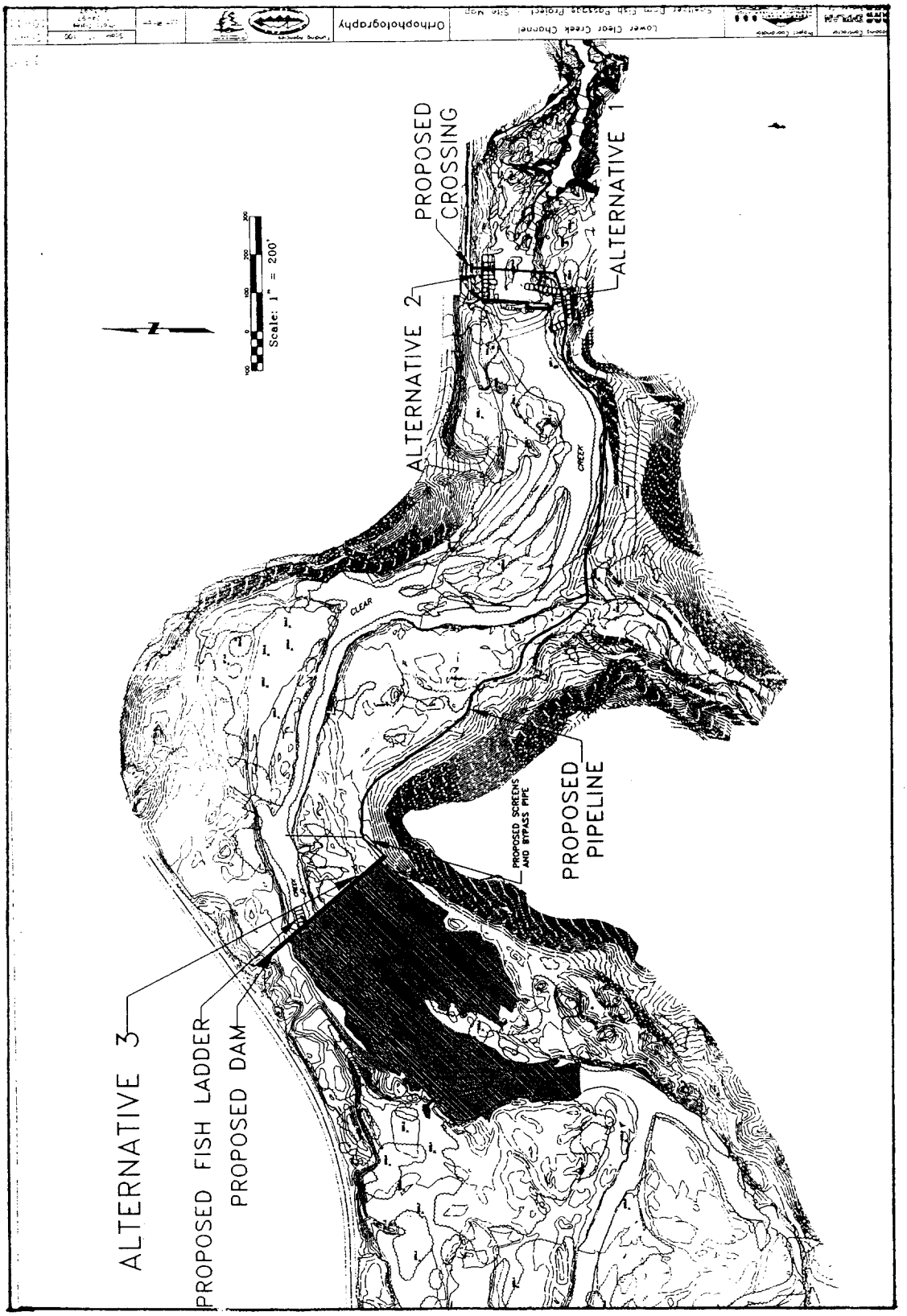
State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

SKETCH MAP

Primary # _____
HRI# _____
Trinomial _____

Page 7 of 7 *Resource Name or # (Assigned by recorder) Saeltzer Dam

*Drawn By: EMPLAN, Redding *Date: 8-5-97



NOTE: Include bar scale and north arrow.

APPENDIX B

SAELTZER DAM
RECORD SEARCH DOCUMENTS

California Archaeological Inventory

Information Center

BUTTE SIERRA
GLENN SISKIYOU
LASSEN SUTTER
MODOC TEHAMA
PLUMAS TRINITY
SHASTA

Department of Anthropology
California State University, Chico
Chico, CA 95929-0400

(916) 898-6256

November 15, 1993

Mr. John Elko
Engineering Studies Section
State of California - Resources Agency
Department of Water Resources
Northern District
2440 Main Street
Red Bluff, CA 96080-2398

RE: CLEAR CREEK SALMON FISHERY RESTORATION;
I. C. File # H93-18
T31N, R5W, Sections 31, 32, 33, and 34;
USGS Olinda and Redding 7.5' and
Anderson and Redding 15' quads
estimated 160 acres (Shasta County)

Dear Mr. Elko,

In response to your request received October 22, 1993, a record search for the above cited project was conducted by examining the official maps and records for archaeological sites in Shasta County.

RESULTS:

PREHISTORIC RESOURCES: There are no recorded sites of this type known to be located within the project boundaries or within a one mile radius of the project area. However, sites have been recorded in areas with environmental settings and topographic features similar to yours but outside the one mile radius. The extensive mining conducted in the region has resulted in a convoluted landscape which may have destroyed any signs of prehistoric use in the area. The project is located in territory occupied in prehistoric and ethnographic times by the Wintu indian group. Wintu territory covered parts of what are now Trinity, Shasta, Siskiyou, and Tehama counties.

HISTORIC RESOURCES: There are no sites of this type recorded within project boundaries. However, three sites of this type have been recorded within the one mile radius. CA-SHA-1696-H is recorded as the scattered remains of Texas Springs (inhabited between 1850s-1870s) which includes a sandstone quarry, 14 stone

foundations of small buildings, a cemetery, a rock ring, roads, placer workings, dumps and ditches. The second site, CA-SHA-1695-H, is associated with the historic settlement of Horsetown and is recorded as the collapsed stone and mud chimney and pad for a cabin, three depressions that might be cabin pads, light scatter of artifacts and nearby tailings, ditches and gold mining workings. The third site, known as the Lamb Historic (no trinomial has been assigned yet), contains a mixture of historic and contemporary materials (1930s to 1960s) on the surface and also subsurface. Additionally, the 1870 land plat shows a historic road passing close to your proposed operation in Section 31. The road is shown on the newer maps as a jeep trail. The USGS quad map also shows the community of Centerville in Sections 19, 24, and 30, a Readings Bar in Section 36, and canyons and creeks of this area containing large amounts of tailings. The tailings are evidence of historic gold mining activities in the region. There could be unrecorded historic cultural resources associated with these areas. The 1945 quad map shows these tailings, and old tailings are considered to be historic cultural resources. Literature shows that two Reading's Bars have been designated where gold was discovered by Reading in 1848, one on Clear Creek and one on the Trinity River. Both sites have been marked with historical markers. The one Clear Creek is California State Historical Landmark # 32.

The streams flowing into the Sacramento River from the Klamath Range in the west were rich in placer gold and attracted several hundred miners during 1848. By the spring of 1849, numerous camps had sprung up along the entire length of Clear Creek and with the most central of these areas being known as the Clear Creek Diggings (later known as Horsetown). The mining settlements which began with the first influx of gold seekers consisted of small tent camps which soon developed into "Boom Towns." Mining localities such as Briggsville, Horsetown, Middletown, Muletown, Shasta, and Texas Springs were all thriving by 1855. By the 1860s, the initial mining boom was receding. Quartz replaced placer mining, and the mining company supplanted the individual miner. By the close of the 1870s, mining again intensified with the development of various hydraulic and lode mining techniques. Although by 1897 copper replaced gold as the leading mineral mined in Shasta County, gold continued to maintain its importance well into the 1930s. Other facts about the project vicinity is that in 1850, Abraham Cunningham set up a mining company to prospect for gold along Clear Creek near your project area. Also, the patented mining claims of the McMullen and Reese Placer Gold Mine, dating between 1870 and 1880, are located somewhere near the project in Section 31.

PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS: According to our records, most of the project area appears not to have been previously surveyed and/or excavated for cultural resources by a professional archaeologist. An area near the McCormic-Saeltzer Afterbay was included in a survey conducted in 1970 (I. C. File # 99). Archaeologists from Chico State College conducted an archaeological reconnaissance on portions of the Whiskeytown, Igo, and Saeltzer Afterbays. As a result of this reconnaissance seven aboriginal and

five historic sites were recorded at this time, none of which are within your project boundaries. However, a map showing the actual survey coverage was not included in this report. Eric Ritter, archaeologist for BLM, notes in a nearby survey report (I. C. File # SH-L-401) that drainages of the area have been heavily placered and here and there are located mining ditches. He felt a further evaluation would lead to the definition of historic sites, including cabin foundations in the area.

LITERATURE SEARCH: Reviewed were the official records and maps for archaeological sites and surveys in Shasta County. Also reviewed were the **National Register of Historic Places-Listed Properties and Determined Eligible Properties** (1988, Computer Listing 1966 through 8-90 by National Park Services), the **California Inventory of Historic Resources** (1976), **California Points of Historical Interest** (1992), **California Historical Landmarks** (1990), **A Century of California Post Offices** (1955), **Place Names of Shasta County** (1966), **Handbook of American Indians**, Volume 8 (1987), **Gold Districts of California** (1978), and **Historic Spots in California** (1966).

RECOMMENDATIONS: Based on the above information, as well as the topography of the project area, the project is located in an area considered to be extremely sensitive for cultural resources. It appears that there are unrecorded historic cultural resources present within project boundaries. In view of these findings, we recommend that a professional archaeologist conduct a cultural resources survey for all areas which will be subject to impact and ground disturbance prior to any project operations. This person will be able to locate, record, assess site significance and then prepare appropriate mitigation measures for those resources.

This record search took one hour of Information Center time to complete, and the charge is $90.00. We will call you soon to arrange for payment of this record search per your instructions. Feel free to call if you have any questions. Thank you for your concern in preserving California's cultural heritage.

Sincerely,

Makoto Kowta

Makoto Kowta, Coordinator
Northeast Information Center

State of California

Memorandum

To : John Elko
Department of Water Resources
Northern District
2440 Main Street
Red Bluff, CA 96080

Date : DEC 1 3 1993

From : Chris Chaloupka, Archaeologist
Nonpoint Source Agricultural Unit
STATE WATER RESOURCES CONTROL BOARD
901 P Street, Sacramento, CA 95814
Mail Code: G8

Subject: CULTURAL RESOURCES SURVEY, CLEAR CREEK FISHERY HABITAT RESTORATION PROJECT

Introduction

Responding to a recommendation from the California Archaeological Inventory at Chico State University a survey for cultural resources was conducted of the proposed Clear Creek Fishery Habitat Restoration Project on December, 1993. This report publishes the findings of the survey.

The Initial Study prepared by DWR for the above project is incorporated by reference and a copy attached. The reader is directed to the Initial Study for descriptions of the proposed project, its location, setting and maps.

The major focus of project activity will be on the wet channel with access from Clear Creek Road through the flood plain to the gravel acquisition and restoration sites. The survey was accomplished by walking the proposed alignments and the shoreline and gravel bars in the vicinity of the restoration areas, examining the ground for evidence of past human activity.

Saeltzer Dam Restoration Site

The proposed access route to the Saeltzer Dam site (Initial Study, Fig. 2.5) and the proposed flow bypass channel were examined. The site access, along an established dirt road did not show any evidence of cultural resources. The restoration site, bypass channel and gravel bar also lacked any physical indications of historic or prehistoric sites.

Renshaw Restoration Site (SITES 1, 2, 3) gmc

The subject is about one-half mile downstream from Saeltzer Dam. Access to the Renshaw site (ibid. Fig 4) is by both existing and undeveloped routes through the flood plain. The site and proposed access did not have any evidence of cultural resources.

Oaks Restoration Site (SITES 4, 5, 6) gmc

The Oaks restoration area (ibid. Fig. 2.8) begins about two miles downstream of Saeltzer Dam. It will be accessed by existing routes through the gravel floodplain. The site and proposed access did not yield any evidence of cultural resources.

Conclusions and Recommendations

The field survey of the proposed access routes and the three fish habitat restoration sites did not find any vidence that the proposed projects will have any impact on any cultural resources. The results of the survey support the initial observation that modern gold recovery and aggregate manufacturing operations have totally altered the natural drainage. My recommendation is that the Lead Agency make a finding of "no impact" for cultural resources.

If you have any questions, please call me at 657-0703.

State of California
The Resource Agency
Department of Water Resources

INITIAL STUDY FOR THE CLEAR CREEK FISHERY HABITAT RESTORATION PROJECT

Introduction

The principle objective of the Clear Creek Fishery Habitat Restoration Project is to maintain and enhance Clear Creek's anadromous fishery. Clear Creek presently produces approximately two percent of the upper Sacramento River salmon run, but with rehabilitation work and increased flows, it could produce around six percent.

Anadromous fishery conditions in Clear Creek have deteriorated. Problems causing this degradation include: diversion of water; heavy sedimentation; reduction of available spawning gravel and past gravel mining activities.

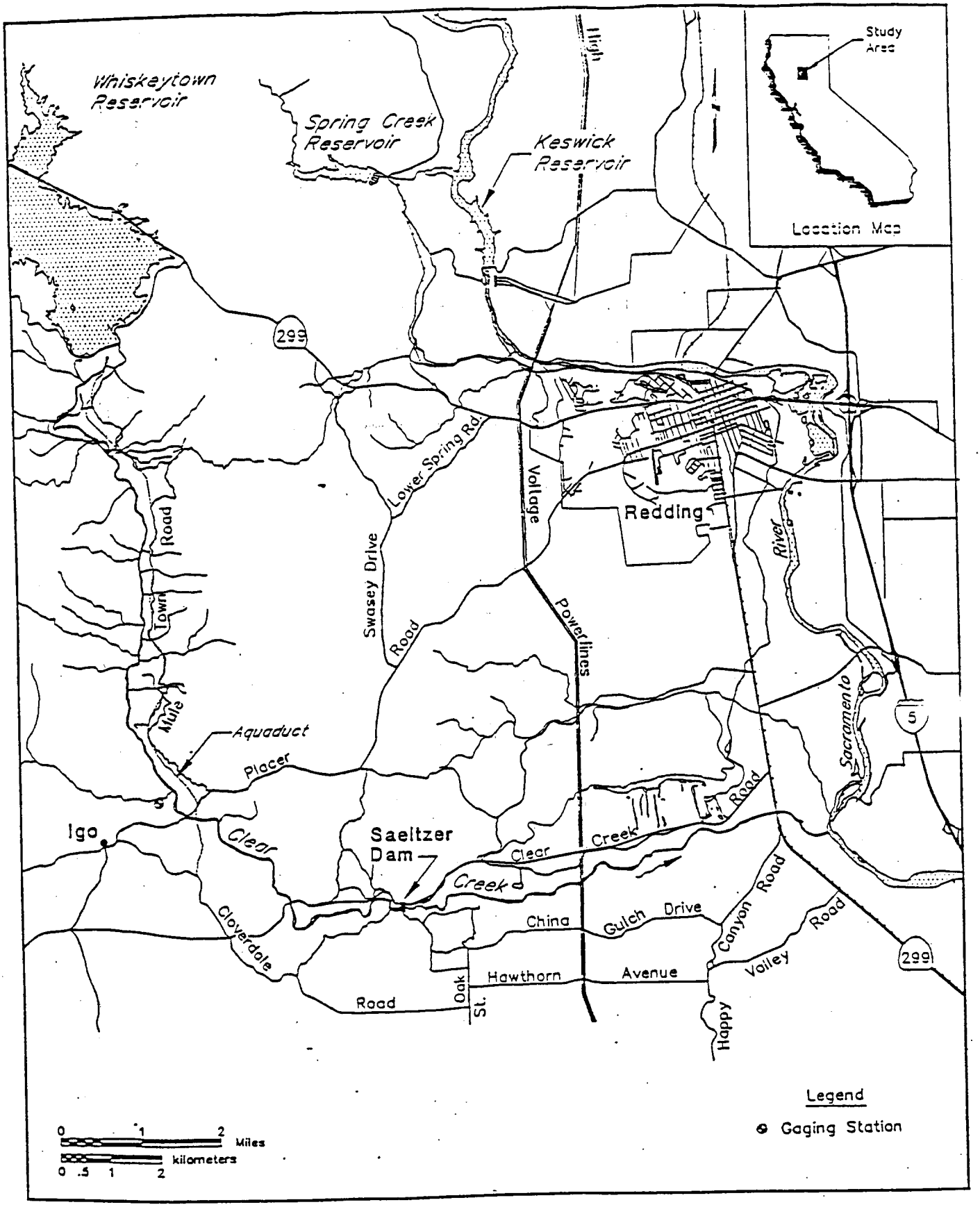
The Clear Creek Fishery Habitat Restoration Project is part of the "Upper Sacramento River Fisheries and Riparian Habitat Management Plan" (Resource Agency, 1989). The restoration plan calls for the increase of water flow from Whiskeytown Dam, purchase of lands for riparian habitat protection, reconstruction of an existing fish ladder and placement of a fish screen at Saeltzer Dam (both recently completed), dredging of sediment above Saeltzer Dam, and restoration of salmon habitat below the Dam. This project includes the last two activities; removal of sediment and restoration of habitat at sites below Saeltzer Dam.

Project Setting

Clear Creek is located in Shasta County, California and is the first major tributary to the Sacramento River below Shasta Dam. Clear Creek begins in the mountains east of Clair Engle Reservoir and flows approximately 35 miles to its confluence with the Sacramento river just south of the City limits of Redding (Figure 1). Whiskeytown Dam was constructed in 1963 and is located about 16.5 miles from the mouth of Clear Creek. Saeltzer Dam was completed in 1903 and is located approximately 10 miles downstream from Whiskeytown Dam at river mile 6.2. This dam diverts up to 25 cubic feet of water per second (cfs) into the Townsend Flat water ditch for irrigation use.

Clear Creek provides resting habitat for waterfowl (e.g. geese, mallard, canvasback, northern pintail, and coot. Songbirds, valley and mountain quail, dove, band-tail pigeon, scrub and

Figure 1



Clear Creek and Vicinity.

stellar's jays, crows, osprey, and several species of woodpeckers are abundant in the area. Twenty-two species of fish were observed in Clear Creek above and below Saeltzer dam during field surveys (DFG 1984) (Table 1). Rainbow trout were the most abundant game fish above Saeltzer Dam. Large and smallmouth bass and bluegill were the most abundant below the dam.

Table 1

Fish Species Observed in Clear Creek Above and Below Saeltzer Dam in 1984

Common Name	Scientific Name
Pacific lamprey	*Lampetra tridentata*
Chinook salmon	*Oncorhynchus tshawytscha*
Steelhead	*Oncorhynchus mykiss*
Rainbow trout	*Oncorhynchus mykiss*
Speckled dace	*Rhinichthys osculus*
Carp	*Cyprinus carpio*
California roach	*Hesperoleucus symmetricus*
Hitch	*Lavinia exilicauda*
Hardhead	*Mylopharodon conocephalus*
Sacramento squawfish	*Ptychocheilus grandis*
White catfish	*Ameiurus catus*
Black bullhead	*Ameiurus melas*
Brown bullhead	*Ameiurus nebulosus*
Mosquitofish	*Gambusia affinis*
Threespine stickleback	*Gasterosteus aculeatus*
Green sunfish	*Lepomis cyanellus*
Bluegill	*Lepomis macrochirus*
Smallmouth bass	*Micropterus dolomieui*
Largemouth bass	*Micropterus salmoides*
Tule perch	*Hysterocarpus traski*
Prickly sculpin	*Cottus asper*
Sacramento sucker	*Catostomus occidentalis*

A search of the Rarefind and Wildlife Habitats Relational Databases indicated that Clear Creek and surrounding areas may support listed and candidate wildlife species such as the bald eagle and bank swallow. Locally occurring species of special concern (SPC), as designated by DFG, include the osprey, northern harrier, Swainson's hawk, long-eared owl, short-eared owl, willow flycatcher, yellow warbler, yellow-breasted chat, merlin, and Pacific fishers. In addition the U.S. Forest Service has listed the northern goshawk as Forest Service sensitive species (FSS). The spotted owl has been listed as a threatened species by the U. S. Fish and Wildlife Service.

The existing fish ladder at Saeltzer dam was modified by the Department of Fish and Game early in 1992. DFG also installed a fish screen on the Saeltzer Dam Diversion Ditch.

Project Description

The Clear Creek restoration project will remove sediment above Saeltzer Dam and improve spawning habitat below the dam (Figure 2).

Removal of sediment will be accomplished by dredging with a hydraulic excavator (backhoe) and will need to be repeated periodically. This dredged material will be evaluated for its potential as a source for spawning gravel material. If found unsuitable, the material may be used for fill in upland areas or processed for commercial use. (Figure 2.5)

A bypass channel may be constructed on the adjacent gravel bar. This channel would divert flows around the dredging work to reduce downstream turbidity. Its alignment would be chosen to minimize impacts to existing vegetation.

Dredging activities may result in the temporary loss of some streamside vegetation (1/8 to 1/4 acre) at equipment access ramps. The work will be designed to keep these losses to a minimum by constructing single paths 15 to 30 feet wide through existing riparian corridors in areas where vegetation can not be avoided. Disturbed areas will be revegetated with appropriate native species.

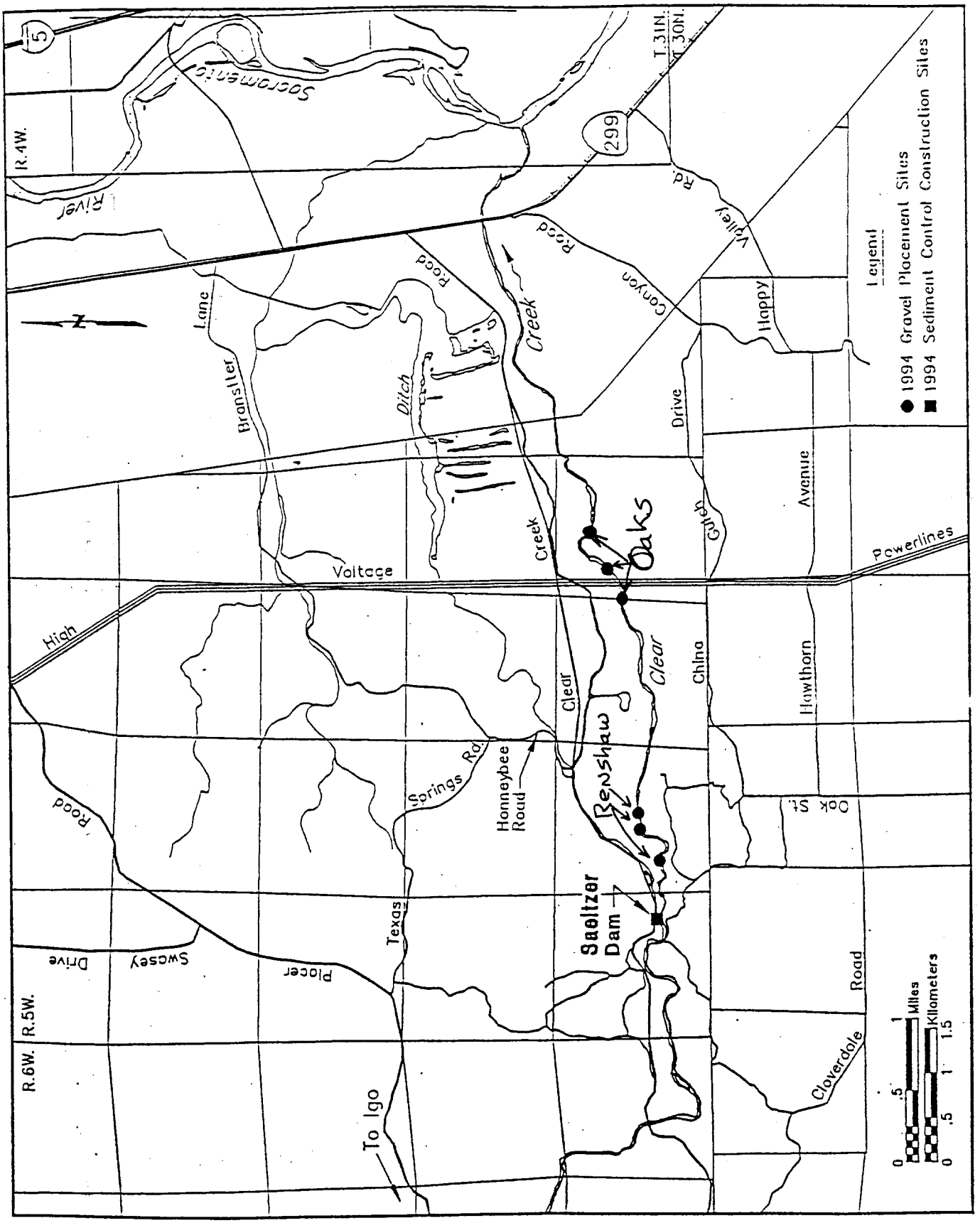
Spawning habitat restoration will involve the placement of 5,000-10,000 cubic yards of cleaned, graded spawning-sized gravel at locations below Saeltzer Dam. Work will include improving existing gravel roads, and constructing short sections of new roads with truck turn around areas for equipment access to Clear Creek. This will result in an impact to approximately 3 to 5 acres of vegetation (mostly grass, with alders and willows near the creek's edge). Access routes will be chosen to minimize disturbing existing vegetation. Depending on future flood flows, spawning areas will require periodic replenishment with new spawning gravel.

Mechnical (tractor) ripping may be used to loosen compacted gravel beds. Loosening gravels will allow fine sediment to flush out during high flows and benthic organisms to establish under the rocks.

As some restoration sites, channel and bank changes will be needed to correct flow depths over spawning riffles. This may involve placement of boulder clusters to direct flows or removal of sediment deposits from within the stream channel. (Figure 2.8)

At locations where there has been extensive loss of gravels, instream structures will be used to reestablish the channel into a low flow meander configuration. These will consist of log, rootwad, boulder and rock reventments on the outside of meander bends, gravel point bars on the inside bends, and/or boulder weirs and clusters to create step-pool sequences (Figure 3).

Figure 2



1994 Clear Creek Restoration Project Sites.

FIGURE 2.5

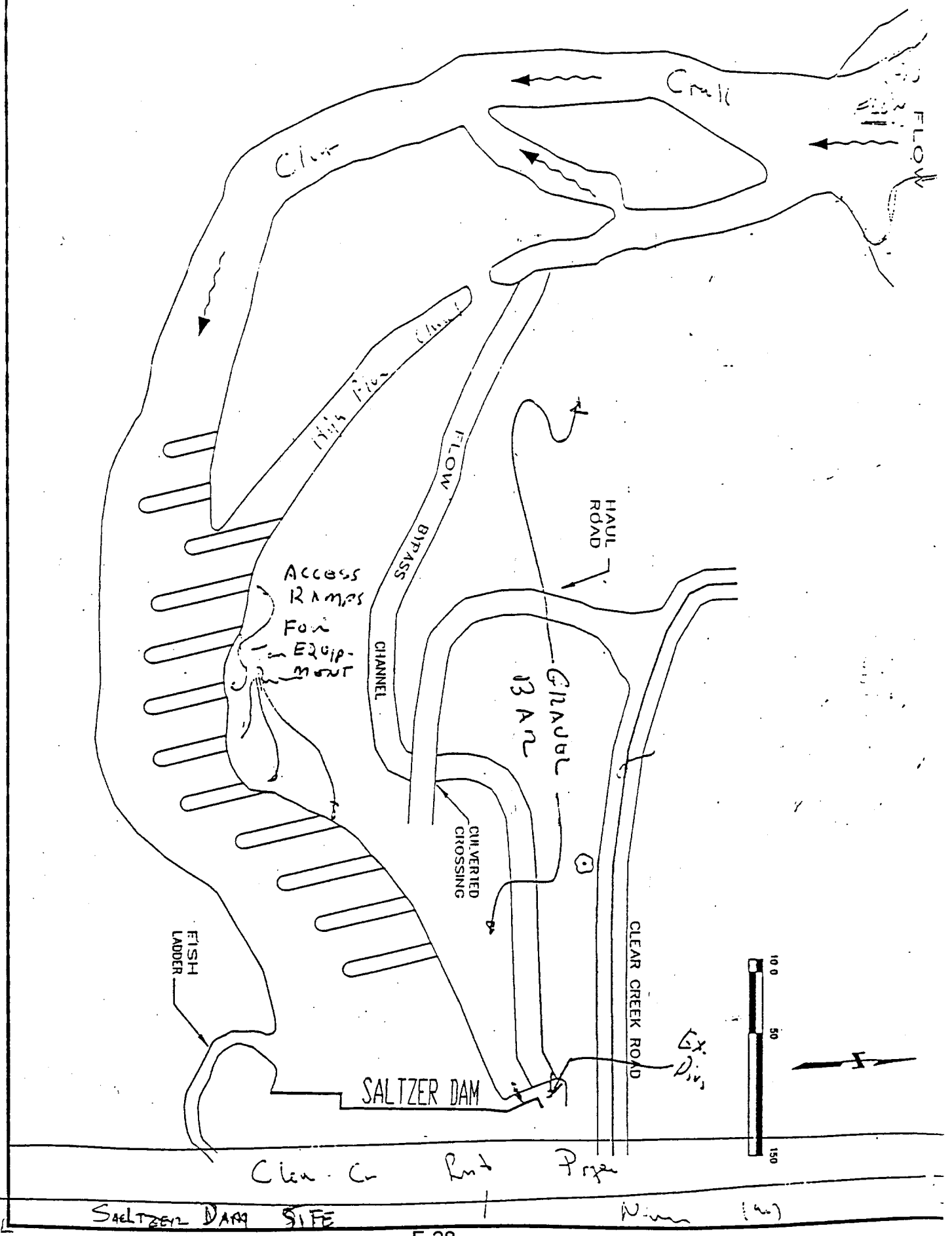
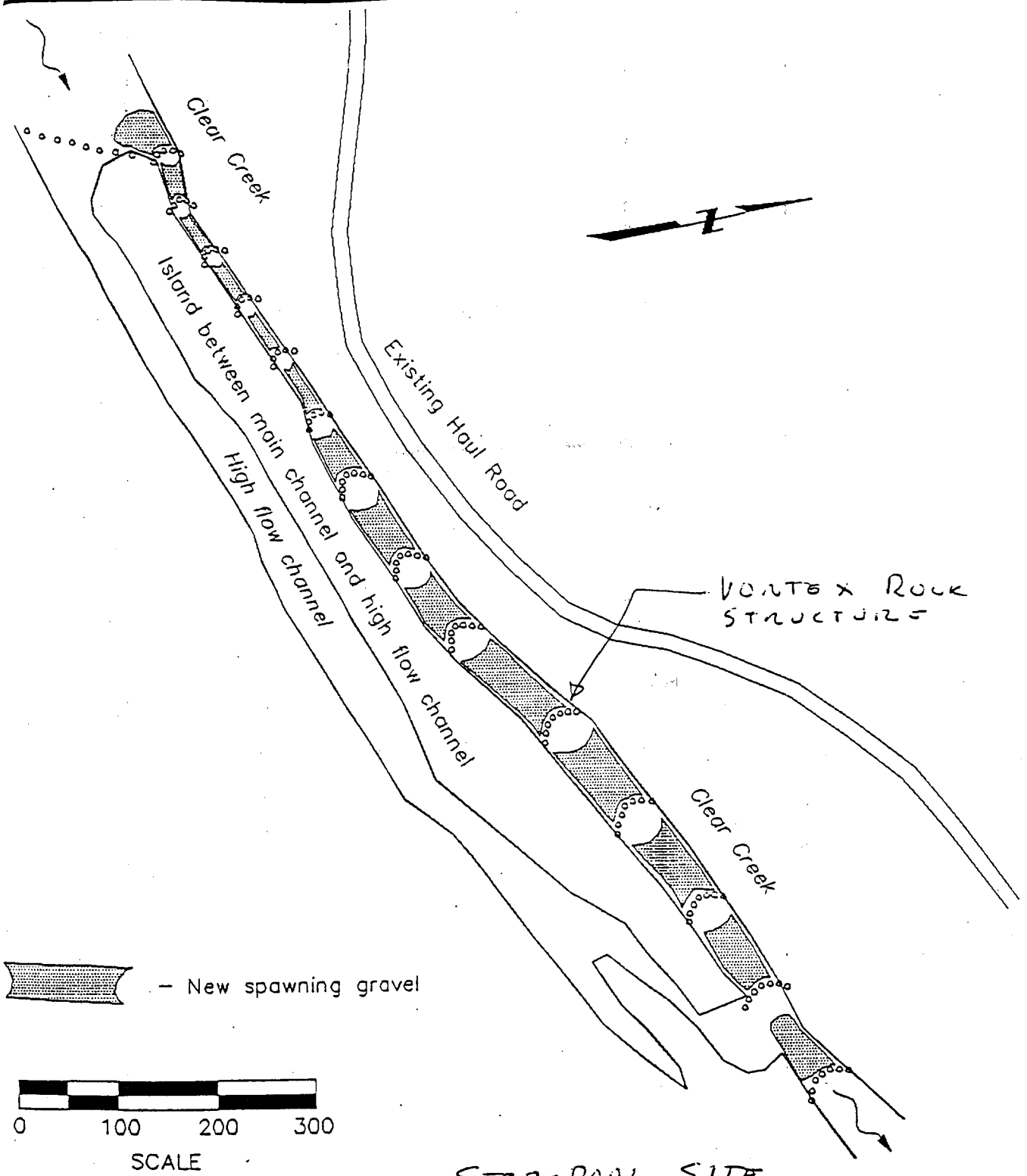

FLOW
HIGH FLOW CHANNEL
FLOW BYPASS CHANNEL
HAUL ROAD
ACCESS RAMPS FOR EQUIPMENT
GRAVEL BAR
CULVERTED CROSSING
FISH LADDER
CLEAR CREEK ROAD
SALTZER DAM
100
50
150
SALTZER DAM SITE

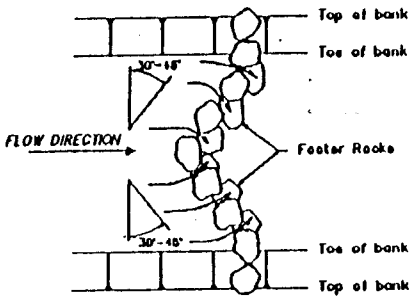
FIGURE 2-8



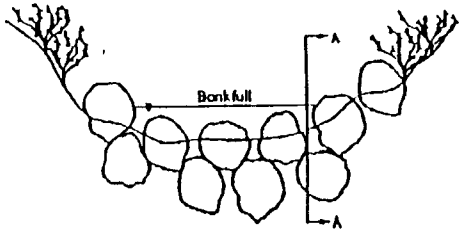
TYPICAL STEP-POOL SITE

Clear Creek Restoration Project

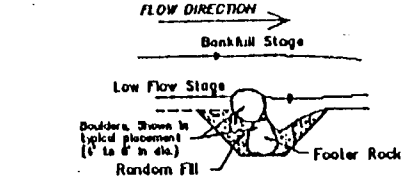
Upper Oaks Site | November 1993



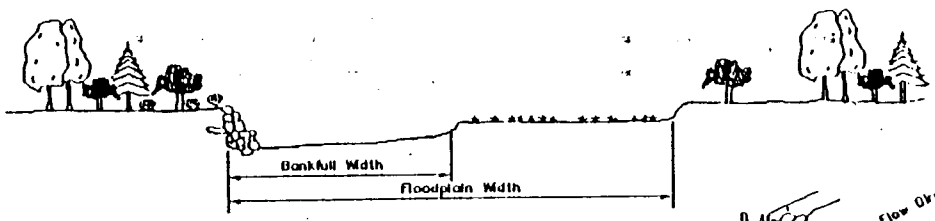
PLAN VIEW FOR
VORTEX ROCK STRUCTURE

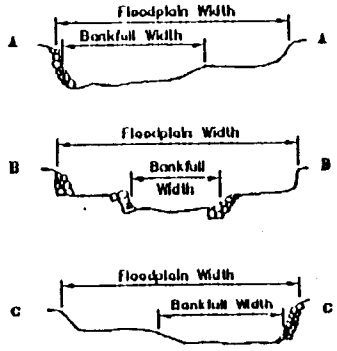


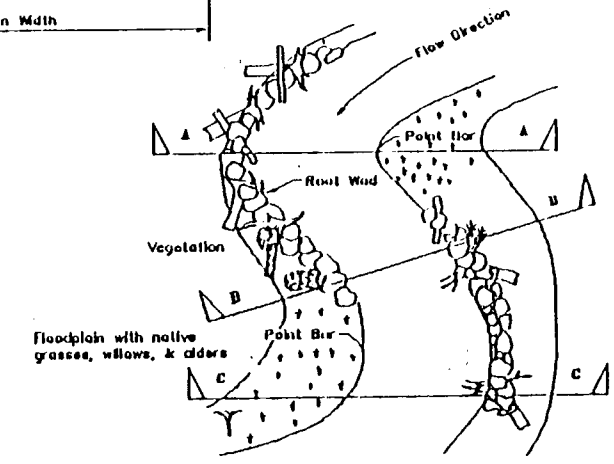
CROSS-SECTIONAL VIEW FOR
VORTEX ROCK STRUCTURE



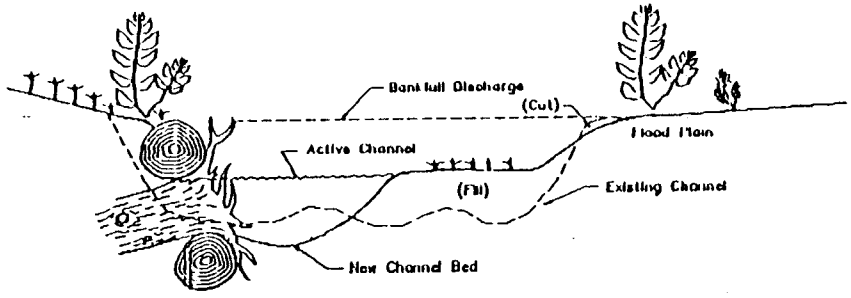
PROFILE SECTION A-A
FOR VORTEX ROCK STRUCTURE







MEANDER SECTION



REVETMENT STRUCTURE

TYPICAL INSTREAM STRUCTURES

Figure 3

An existing sandy bank located about 3/4 mile down stream from Saeltzer Reservoir will be stabilized by vegetation planting and other means to prevent it from eroding and damaging restored spawning areas. The design will include use of logs and boulders to provide pool and overhead cover for fish (Figure 4). Future habitat restoration maintenance work may include this type of channel stabilization at other sites.

Management Practices

Saeltzer Dam Maintenance Dredging

Management activities above the dam will include periodic dredging to remove accumulated sediment. The frequency of this procedure will be dependent on future runoff.

Projects may use a suction dredge system to remove new sediment. Material could be pumped up to 1 miles away to settling basins located above the flood plain. This material could then be used as fill or be processed for a commercial sand or gravel product. A suction dredge system would reduce turbidity that might overwise flow downstream during conventional excavation operations. Discharge water would be contained in settling basins, and percolate through the gravels.

Habitat Restoration Sites

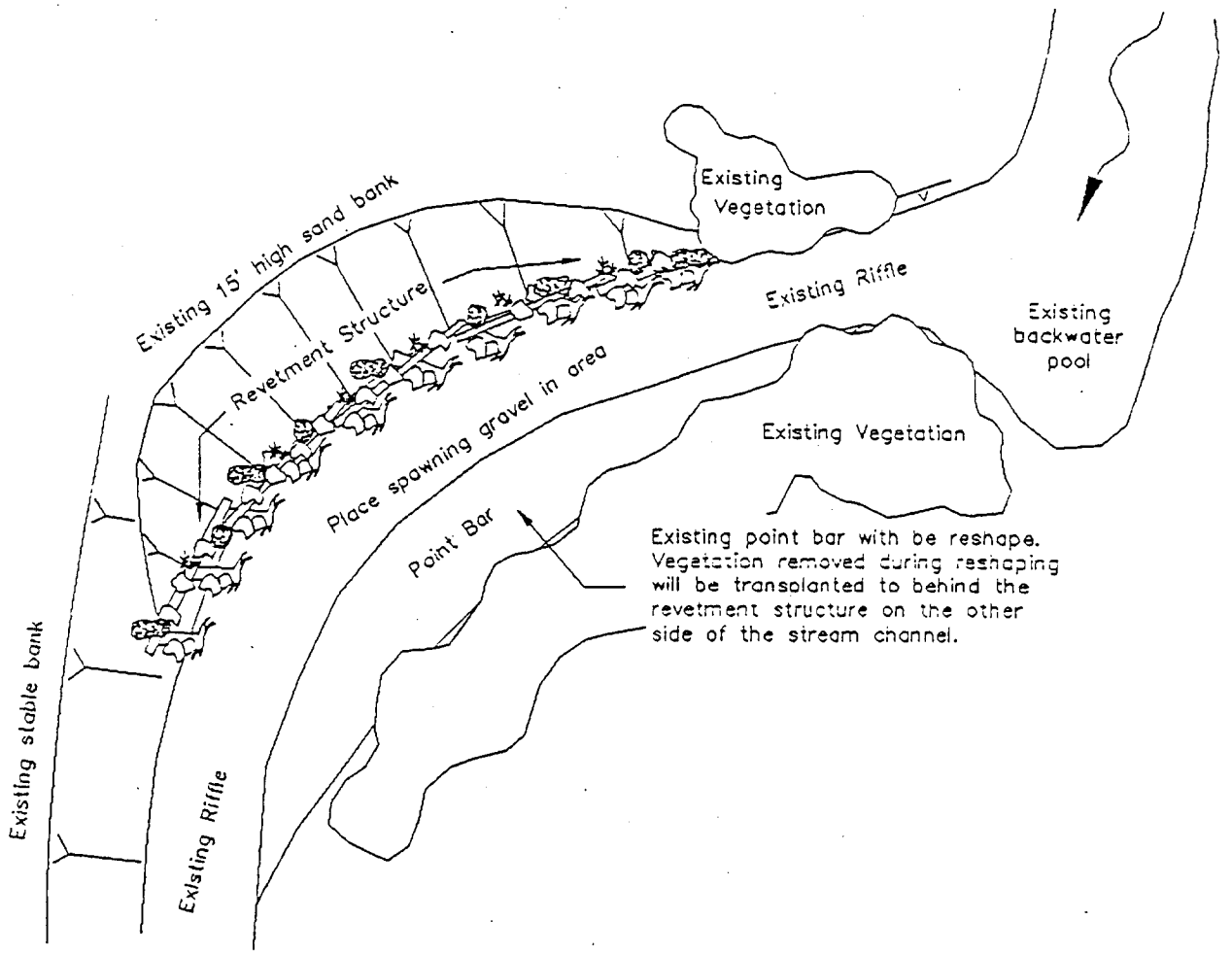
These sites will be monitored by DFG Biologists during redd surveys. They will observe sites for spawning activity, downstream movement of placed gravel, and damage to instream structures and will make recommendations for future restoration and management activities.

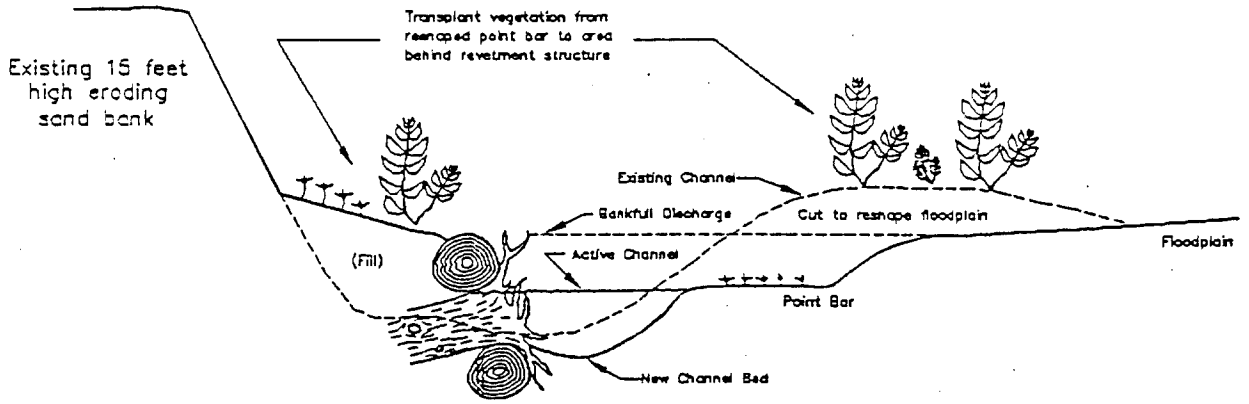
Project Relationship to Upper Sacramento River Fisheries and Riparian Management Plan

The Upper Sacramento River Fisheries and Riparian Management Plan calls for the purchase of land or easements along Clear Creek to allow long-term protection of riparian habitat. Also, increased flow releases from Whiskeytown Dam are proposed. Flows would be increased from 42,000 to 91,000 acre-feet annually, and provide about 150 cfs flows at Saeltzer Dam April through Mid-October and 200 cfs flows during the rest of the year.

Additionally, the plan identifies needs for maintenance dredging of Saeltzer Reservoir; mechanical ripping of existing gravel areas to improve natural spawning and flood production; construction of instream strucutures from boulders, rock or wood (logs) to create new fish cover and resting habitat; and

restoration of spawning riffles both below and above Saeltzer Dam.





REVETMENT STRUCTURE
CROSS-SECTIONAL VIEW

RENSHAW SITE

TYPICAL BANK STABALIZATION AND HABITAT IMPROVEMENT SITE

The Clear Creek Fishery Habitat Project, while a component of the management plan, is not dependent upon other features being implemented to provide fishery benefits. In addition, construction of this project does not commit DWR, DFG or USBR to complete other components of the plan. When additional activities are proposed, environmental documents will be prepared to evaluate their effects.

The Northeast Center of the California Historical Resources Information System

BUTTE SIERRA
GLENN SISKIYOU
LASSEN SUTTER
MODOC TEHAMA
PLUMAS TRINITY
SHASTA

Department of Anthropology
California State University, Chico
Chico, CA 95929-0400

(916) 898-6256

September 30, 1997

Bob Orlins
Department of Water Resources
Environmental Service Office
3251 S Street
Sacramento, CA 95816-7017

RE: SAELTZER DAM FISH PASSAGE PROJECT;
I.C. File # H97-15
T31N, R5W, Section 31;
USGS Olinda 7.5' and Anderson 15' quads
estimated 40 acres (Shasta County)

Dear Mr. Orlins,

In response to your request received September 5, 1997, a record search for the above mentioned project was conducted by examining the official maps and records for archaeological sites in Shasta County.

RESULTS:

PREHISTORIC RESOURCES:. Our records indicate that there are no recorded sites of this type known to be located within the project boundaries. However, sites of this type have been recorded in areas with similar environmental settings and topographic features, but these sites are not located in the vicinity of this project.

HISTORIC RESOURCES: Our records indicate that there are no recorded sites of this type known to be located within project boundaries. However, the project is located in an area that saw a lot of historic activity, especially during the days of the gold mining. The project is located within the historic gold mining districts of Igo-Ono (**Gold Districts of California** 1970:138). One site, CA-SHA-1695H (a gold mining cabin, with artifacts and nearby mine tailings) has been recorded by the Bureau of Land Management during an archaeological survey of the proposed DBA Sunrise (Williams) mining operation along Clear Creek (I. C. File # SH-L-400, dated February 1986). This survey was conducted on a parcel immediately adjacent to the northwest boundary of the project area. The site has been plotted in red on the enclosed map for your

information. If you want a copy of the site record or this survey report let us know. The USGS Anderson 15' quad map (1947) also shows the Saeltzer Dam in Section 31, mine tailings all along Clear Creek, and Reading Bar to the west in Section 36. Gold was discovered at Readings bar in 1848 (California Historical Landmark No. 32).

PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS: According to our records, some of your project area has been included in archaeological projects by professional archaeologists (I. C. Report #s 99, 1491, SH-L-401). A brief description of these projects is as follows:

99..... Back in 1969, archaeologists with California State University, Chico conducted an archaeological reconnaissance for portions of the proposed Whiskeytown, Igo, and Saeltzer Afterbays in Shasta County (the report is dated June 1970) . However, no survey coverage map was included within the report. So it is not clear what ground was examined for cultural resources at this time. Seven aboriginal and five historic archaeological sites were recorded during the study, but none of these sites are located within or adjacent to your project area. A copy of the title page and project map from this report have been included for your information. Additionally,

1491..... The Bureau of Land Management (BLM) conducted an archaeological reconnaissance for the Clear Creek Spawning Gravel Placement Project, part of which was within your project area. No Areas of prehistoric or historic significance were noted in the area. This survey has been plotted in green on the enclosed map and a copy of the report has been included for your information.

SH-L-401..... The Bureau of Land Management also conducted an archaeological reconnaissance of the M. L. Hubbard proposed mining operations along Clear Creek. No archaeological sites were recorded as a result of this reconnaissance, however, it was noted that the entire area has been heavily mined, probably the most during the 1850-1900 period. The archaeologist indicated that further evaluation of the BLM parcel would no doubt lead to the definition of historic sites, including cabin foundations. This survey has been plotted in green on the enclosed map, and a copy of the report is included for your information.

LITERATURE SEARCH: Reviewed were the official records and maps for archaeological sites and surveys in Shasta County. Also reviewed were the **National Register of Historic Places** - Listed properties and Determined Eligible Properties (1988, Computer Listings 1966 through 7-96 by National Park Service), the **California Inventory of Historic Resources** (1976), **California Points of Historical Interest** (1992), **California Historical Landmarks** (1990), **California Office of Historic Preservation Determinations of Eligibility for Shasta County** (1997), and **The Directory of Properties in the Historic Property Data File for Shasta County** (1997).

RECOMMENDATIONS: Based upon the above information and the local topography, the project is located in an area considered to be extremely sensitive for cultural resources. You may wish to contact the appropriate local Native American group regarding information on unrecorded ethnographic sites which may be located within project boundaries for which we have

no records. You may also want to consult historic Government Land Office maps for unrecorded historic sites which may be located within project boundaries for which we have no records. If the project is located within or adjacent to Forest Service or Bureau of Land Management lands, we recommend that you contact the appropriate agency for information on sites which may extend into project boundaries for which we have no records.

The charge for this record search is $92.10. (one hour of Information Center time @ $90.00 plus 14 copies a 15 cents per page). An invoice for billing purposes will be mailed to Joyce Lacey, Department of Water Resources, Northern District Office, 2440 Main Street, Red Bluff, California, 96080 as you requested. Thank you for your concern in preserving California's cultural heritage.

Sincerely,

Makoto Kowta

Makoto Kowta, Coordinator
Northeast Information Center

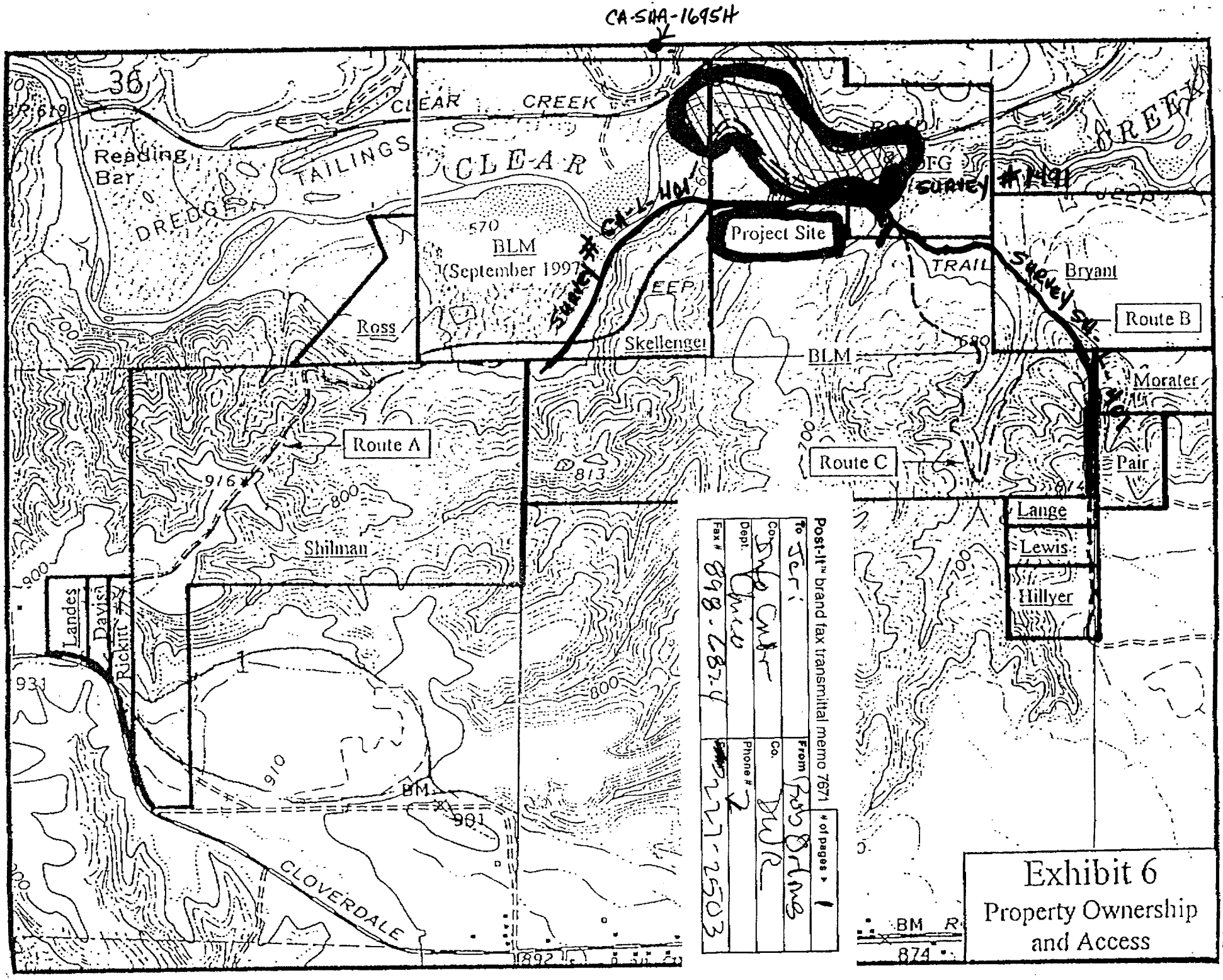


Exhibit 6
Property Ownership and Access

ARCHAEOLOGICAL RECONNAISSANCE

OF THE PROPOSED

WHISKEYTOWN, IGO, AND SAELTZER AFTERBAYS

IN

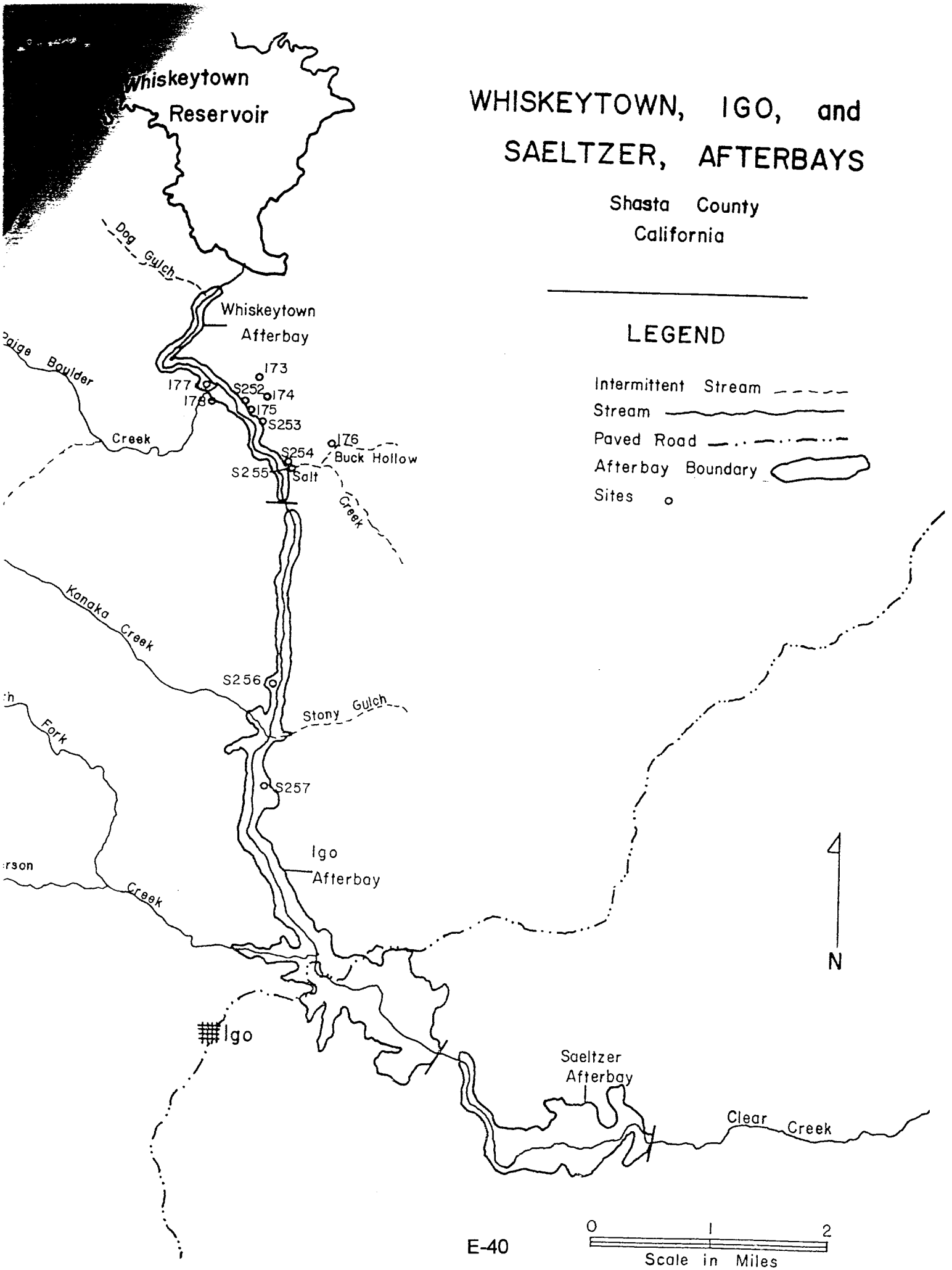
SHASTA COUNTY, CALIFORNIA

BY

KEITH L JOHNSON

Prepared for the National Park Service, Western Region, by the Department of Anthropology, Chico State College in partial fulfillment of Contract-Purchase Order #940-347.

June 1970



WHISKEYTOWN, IGO, and SAELTZER, AFTERBAYS

Shasta County
California

LEGEND

Intermittent Stream
Stream
Paved Road
Afterbay Boundary
Sites

District NORCAL

Area Redding

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
CALIFORNIA STATE OFFICE

Ref. No. FY 96

PART 1

1491

ARCHAEOLOGICAL RECONNAISSANCE REPORT FORM

(To be prepared in partial compliance with BLM Manual 6231.2, .3 & .4 and 36 CFR 800)

1. Title of Project or Action: Clear Creek Spawning Gravel Placement Project
(If no project involved, attach sheet explaining rationale for AR)

2. Name of AR Reporter: Tricia Moehle
Title/Office/Address: Archaeological Technician

Institution: BLM - Redding No. of Assistants: 0

3. Project Location (Attach Map): T31N R5W Sec 31.

District: UKIAH Planning Unit: N/A
Area: REDDING RESOURCE AREA USGS Quad: OLINDA 1:24000 QUAD
Other Maps: N/A
Air Photo: Proj. No. N/A Flt. Line: N/A
Frame: N/A Date: N/A
Other (type of film, etc.): N/A

4. Pre-Field Research
Sources of Data:

a. ☒ District Cultural Resource Files.

b. ☐ Other BLM Files (Specify)

c. ☐ Institutional Records (Attach correspondence and specify):

d. ☐ State Historic Preservation Officer Review (attach correspondence)

e. ☐ Informants (Specify):

Name	Address	Relat. To Area	Age
(1) None			
(2)			
(3)			
(4)			

g. ☐ Published or unpublished documents (specify):

Author	Title	Page(s)	Publisher/Location
None			

CSO 6230-1
3/76

h. National Register Checked: Results Negative [X] Positive [ ]

National Register Properties: _____

5. Field Research

a. Type of Coverage

[ ] Intuitive Cursory
[ ] Intuitive Controlled
[ ] Probability Sample
[X] Complete

% Coverage 100

b. Coverage: Describe the way the area was examined and attach map showing extent and intensity of coverage: The area was surveyed by Tricia Moehle with the help of a project map; area was covered by meandering throughout area. ~ 15 m intervals -

c. Special Problems encountered: NONE

2½' deep creek - forded

d. Cultural Resources recorded? Yes [ ] No [X]

6. Certification: I certify that I conducted the Archaeological Reconnaissance reported here, that my observations and methods are fully reported, and that this ARR is complete and accurate to the best of my knowledge:

Tricia Moehle — Name
10/24/96 — Date
Archaeological Technician — Title
BLM - Redding — Affiliation

7. Profession Review: I have reviewed this ARR and find it acceptable according to professional standards with the following exceptions:

[X] None [ ] Refer to Secs. _____ on attached Evaluation of Completeness Form. (Attach Evaluation of Completeness form To all ARRs)

Eric W Ritter — Name
6/24/96 — Date
Archaeologist — Title
BLM - Redding — Affiliation

(2)

CSO 6230-1

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
CALIFORNIA STATE OFFICE
ARCHAEOLOGICAL RECONNAISSANCE REPORT FORM

PART II

Title of Project: Clear Creek Spawning Gravel Placement Proje
Name of AR Reporter: Tricia Moehle
District: UKIAH Area: REDDING RESOURCE AREA
Planning Unit: N/A

1. General Project Description:

Project is to attempt to restore stream bed by pushing gravel into the stream and allowing high waters to distribute Gravel. area surveyed is to be used as a storage area for the materials that will be pushed into channel.

2. General Environmental Description: (Consider geology & hydrology, flora & fauna, recent cultural and natural alterations, etc.):

Project area with slopes 5-8%. Northern Boundary of survey area is Clear Creek. Eastern Boundary is Drainage channel cut through Bedrock. Metamorphic Rocks of the Eastern Klamath Terrain of the Klamath Mountains (either Copley Greenstone, or the Bragdon formation)

Note - area is very disturbed. litter (Broken glass, paper, and metal) is scattered over entire area surveyed. Area appears to be used as a small picnic-type area with easy access to clear creek.

1

CSO-6230-2
3/76
Page 1 of 4

3. OBSERVATIONAL EXPECTATIONS (Cite all references listed in Part I (4-g) (By Number)

a. Expected Prehistoric Land-Use

Camp sites, MIDDEN, Temporary Camps, Lithic Scatters, etc.

b. Ethnographic Group: WINTU

c. Prehistoric Complexes: Shasta

d. Expected Historic Land-Use:

Early Gold mining to Dredge Mining

e. Expected Areas of Archaeological Sensitivity: (Indicate on coverage map)

Along Creek Terrace

4. FIELD METHODS

a. Describe Method of Search (If not fully described in Part I-5):

See I-5

b. Portions of Affected Property Not Inspected: None

(1) Location (Key to coverage Map):

(2) Reason not inspected: N/A

c. Portions of Affected Property Less than Completely Inspected:

(1) Location (Key to coverage Map): N/A

(2) Reasons not completed inspected: N/A

a. Cultural Resources Recorded: (Reference State/County site or PU numbers; attach archaeological, historical or architectural records sheets or supplements)

Prehistoric Sites	Historic Sites	Architecture (type)
NONE	NONE	NONE

b. Cultural Resources Noted but not Formally Recorded: (Key to Coverage Map)

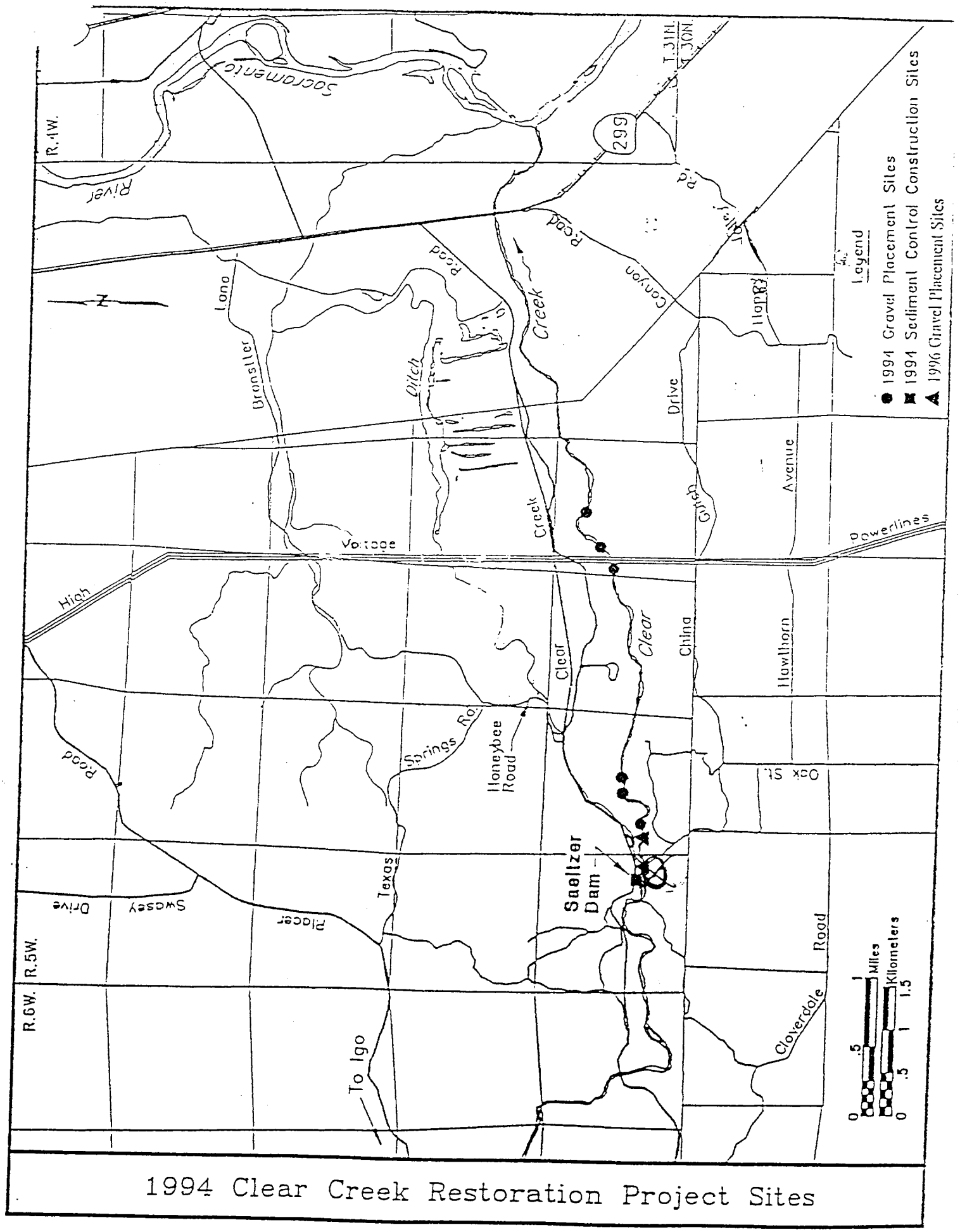
Field No.	General Description	Reason Not Recorded
None		

c. Ancillary Environmental Resources Noted (Game trails, Rodent burrows, etc., not already noted):

d. Comments: No areas of prehistoric or Historic Significance were Noted in area

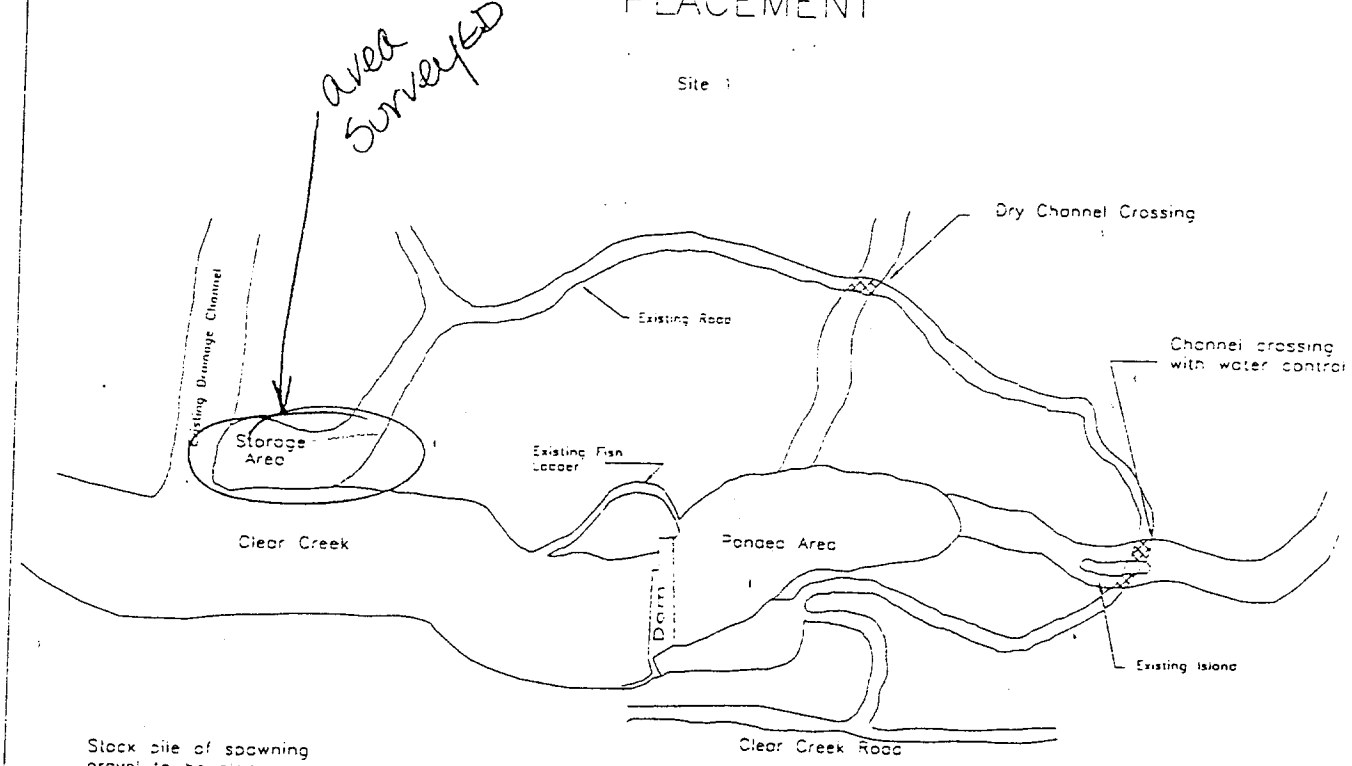
e. Recommendations: NONE

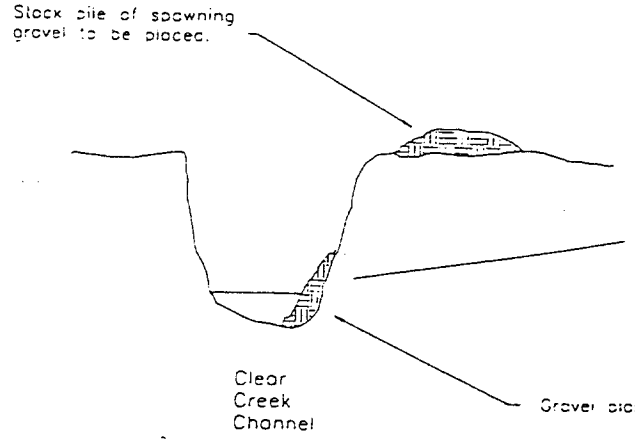
Figure 1. Previously Approved 1994 DWR Project Map with 1996 Location Modification



CLEAR CREEK SPAWNING GRAVEL PLACEMENT

Site 1





NOTE: Storage area will be stock piled with material that will be pushed into the channel for the high water flows to disperse. No equipment will be in the channel at anytime. The channel will not be blocked with gravels to cause any impoundment of water to occur.

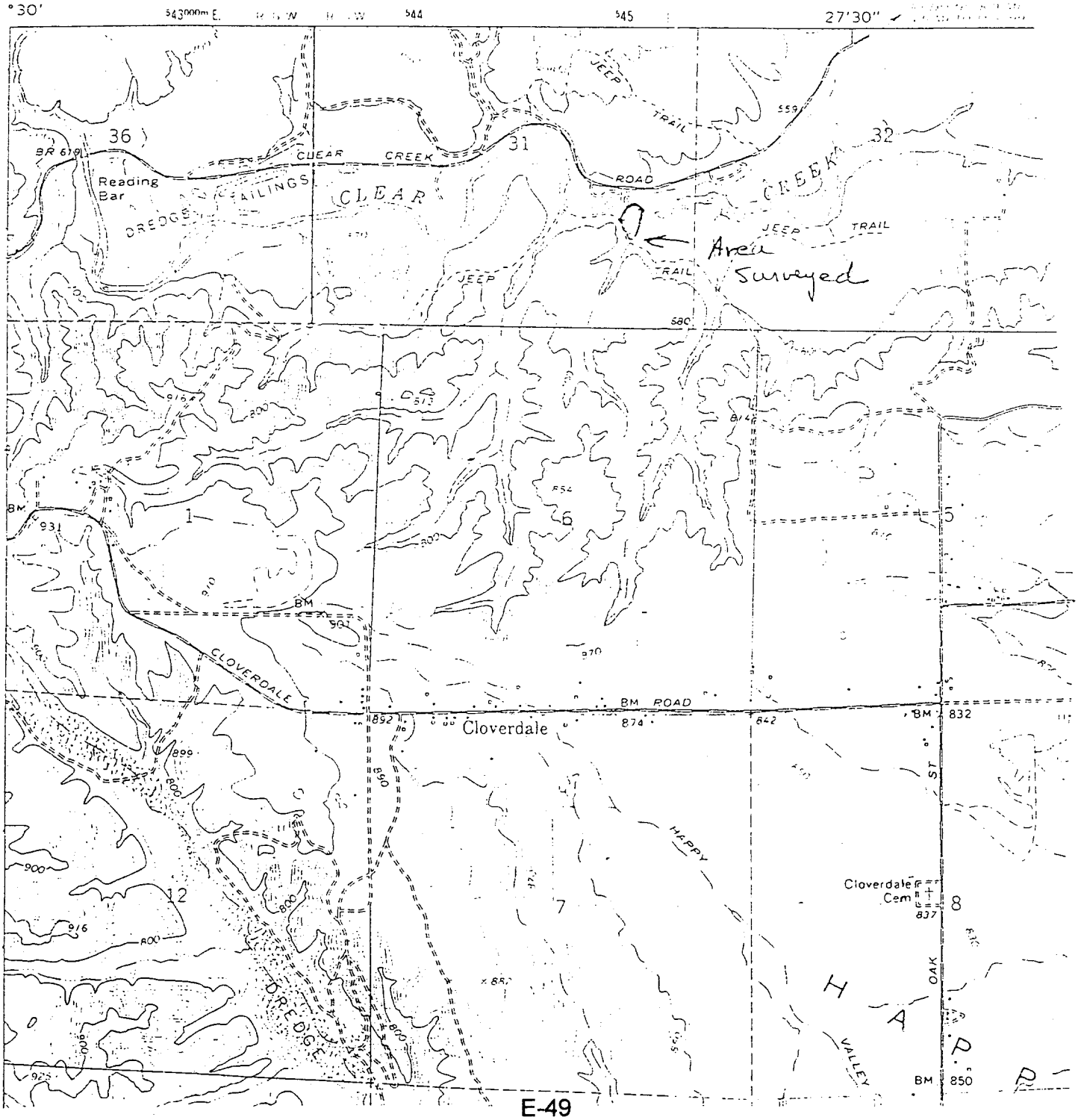
SCALE: NTS

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

Designed: G. Hubatka 5-8-96	Aproved:	Title:
Drawn:	Engr Class:	Drawing No.: 1

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

OLINDA QUADRANGLE
CALIFORNIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
NW/4 ANDERSON 15' QUADRANGLE
1:24000



SH-L-401
Isolated Hist. Finds
Rec. 11/89

UNITED STATE DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
UKIAH DISTRICT OFFICE
REDDING RESOURCE AREA
~~3555 Hemsted Drive~~
Redding, California 96002

8100
6/6/89

To: Ron Rogers, Geologist

From: Eric Ritter, Archaeologist

Subject: An Archaeological Reconnaissance of the M.L. Hubbard Proposed Mining Operation along Clear Creek, Shasta County, California

M.L. Hubbard of Capistrano Beach, California has filed a Notice of Intent to conduct mining operations on BLM administered land located in Shasta County along Clear Creek. This proposed operation is to be located in T. 31 N., R. 5 W., NE 1/2 of the SE 1/2 of the SE 1/2 of Section 31.

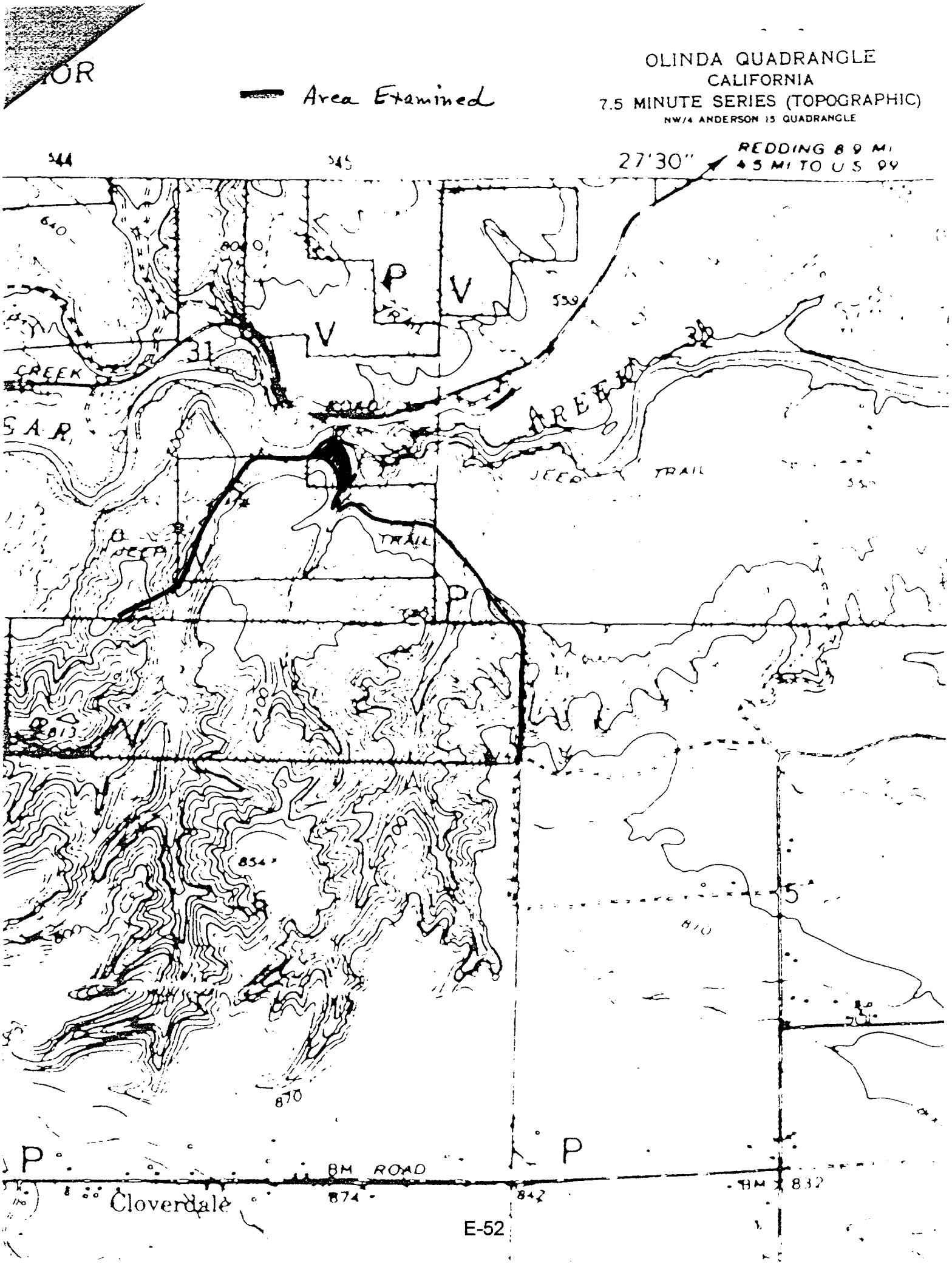
The proposed action will be a gravity test program consisting of backhoe trenching and loading of ore materials into -10 screens. The -10 residue will consist of about 10% of the total which will be processed off-site. The remaining materials will be returned to the trenches as part of the reclamation. Brush will be removed from the immediate area of extraction. An existing road will be used. A settling, recirculating pond will be cut near the trench to conserve and control all waste water. All water drainage will be channeled to the pond. Water will be piped in over mining claims owned by the operator starting from the SE corner of adjoining Section 6 (private land). The pipe will be staked in place causing minimal surface degradation. Seeding will follow reclamation. Each batch to be run will consist of one to two tons. Annual surface disturbance is listed as 0.1 acre. The total area of proposed action is within an area less than 10 acres in size.

An archaeological reconnaissance of the area was conducted on May 22, 1989 by the author. A general survey was made of the roads and some of the area nearby to the proposed operation (see attached map). In addition a meandering sweep was conducted through the approximate location of the mining operation. It was difficult to determine the exact location of the proposed mining based solely on the topographic map and operators's map as no flagging or other identifying markers were present. In addition, the parcel is covered with thick vegetation.

Based on the survey no archaeological sites that warranted recording were discovered. However, the entire area has been heavily mined in the past, probably mostly in the 1850-1900 period. The ground has been extensively worked resulting in a convoluted landscape transected here and there by mining ditches. Drainages have been heavily placered. Hydraulic mined escarpments are situated nearby as are extensive tailing piles. There are fines present within the proposed mining area. A further evaluation of the BLM parcel would no doubt lead to the definition of historic sites, including cabin foundations.

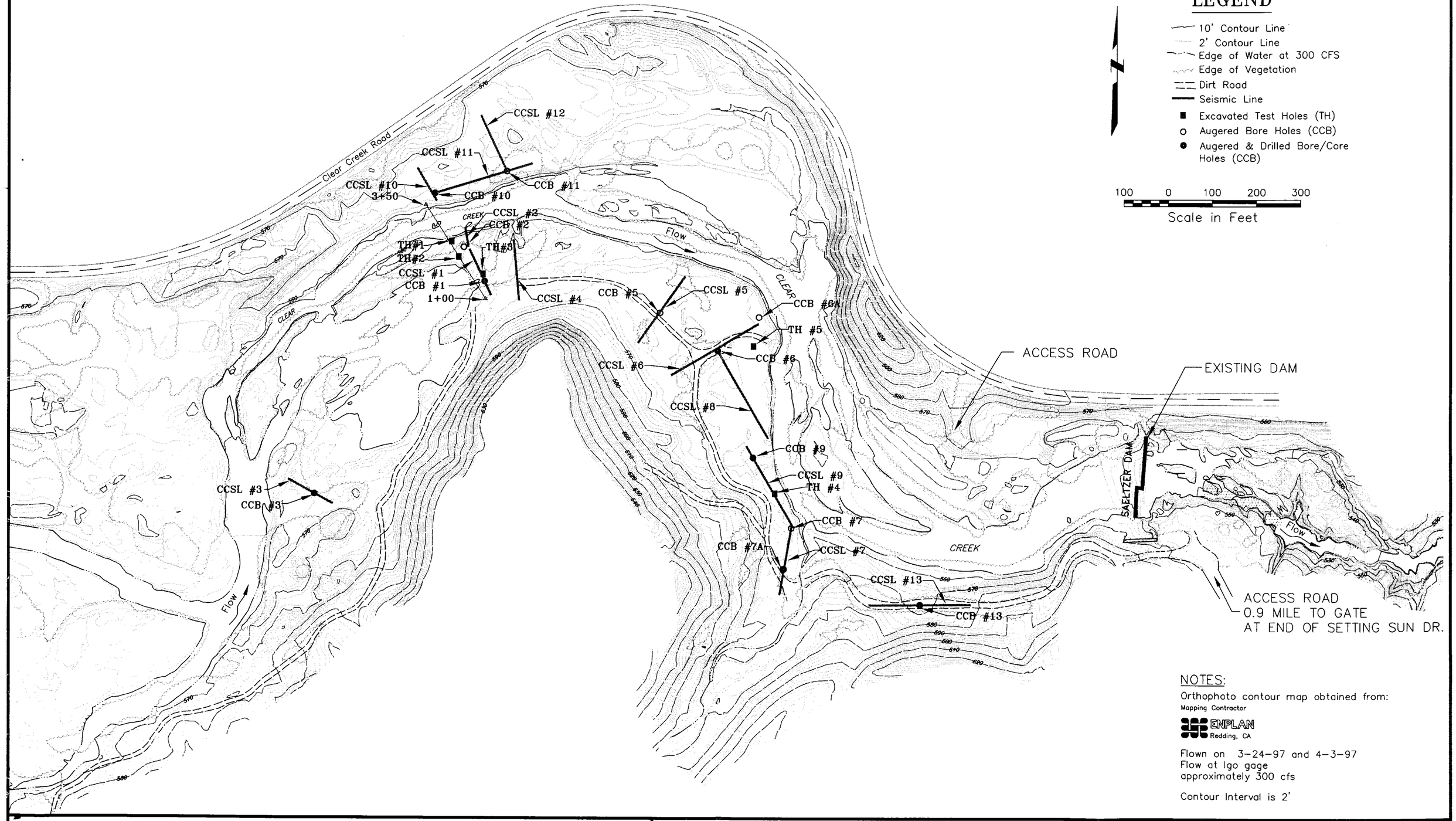
A review of the historic land plats was conducted. The 1870 plat shows a historic road passing close to the proposed operation. The BLM parcel adjoins on the south patented mining claims of the McMullin and Reese Placer Gold Mine dating between 1870 and 1880, the most likely time of the mining in the BLM parcel that is most noticeable.

Based on the survey no cultural sites of apparent significance were found. Mr. Hubbard should be alerted to the fact that historic cabin foundations might be present within the brush. These should be avoided.


OR
Area Examined
OLINDA QUADRANGLE
CALIFORNIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
NW/4 ANDERSON 15 QUADRANGLE
REDDING 8 9 MI
4 5 MI TO U S 99
27'30"
344
345
640
530
31
32
CREEK
SAR
JEEP TRAIL
TRAIL
854
870
810
5
P
V
BM ROAD
BM 832
874
842
Cloverdale

Appendix F

Geologic Exploration Map and Summary Sheets



NOTES:

Orthophoto contour map obtained from:

Mapping Contractor

ENPLAN
Redding, CA

Flown on 3-24-97 and 4-3-97
Flow at Igo gage
approximately 300 cfs

Contour Interval is 2'

SAELTZER DAM FISH PASSAGE PROJECT

Clear Creek near Redding, California

Geologic Investigation Map

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
NORTHERN DISTRICT

Revision Date: Dec. 2, 1997

DRAWING : SDGEO.DWG

Sheet 1 of 1

Saeltzer Dam Fish Passage Project

Seismic Refraction Line Data Summary Sheet

CCSL #	Phone Space (ft)	# of Phones	Line Length (ft)	Shot Offsets (ft)	Bearing	Notes
1	5	24	115	5&15	N25W	
2	5	10	45	5&15	N10W	Continued From CCSL
3	5	24	115	5&15	N61W	
4	6	24	138	5&15	N5W	* See Notebook
5	8	24	184	5&15	N35E	
6	10	24	230	5&15	N63E	
7	7	24	161	5&15	N10E	
8	10	24	230	5&15	S30E	
9	9	24	207	5&15	S30E	
10	5	18	85	5&15	N30W	
11	10	24	230	10&15	N73E	Surveyed Elevations
12	6	24	138	5&15	N25W	
13	10	24	230	10&15	S89E	* See Notebook
Total			2108			

Saeltzer Dam Fish Passage Project

Summary of Augering and Core Drilling Information

Drill Hole #	Ground Elevation (ft)	Depth of Augering (ft)	Bedrock Elevation (ft)	Depth of Coring (ft)	Core Hole Bottom Elevation (ft)
CCB1	561.2	19.0	542.2	10.0	533.0
CCB2	564.3	19.0	545.3	10.0	535.3
CCB3	567.0	20.0	547.0	10.0	537.0
CCB5	566.8	15.0	551.8	N.A.	N.A.
CCB6	565.7	19.5	546.2	12.5	533.7
CCB6A	565.0	16.0	549.0	N.A.	N.A.
CCB7	564.0	14.0	550.0	N.A.	N.A.
CCB7A	564.5	15.5	549.0	15.0	534.0
CCB9	563.9	19.0	544.9	15.5	529.4
CCB10	566.1	15.6	550.5	10.0	539.6
CCB11	565.2	>12	553.2	N.A.	N.A.
CCB13	569.0	15.0*	558.0	10.0	544.0

* Depth to decomposed bedrock = 11.0'

Summary of Test Hole Information

Test Hole #	Ground Elevation (ft)	Depth of Excavation (ft)	Bottom of Pit Elevation (ft)
1	563.0	8.0	555.0
2	562.9	10.0	552.9
3	560.4	10.0	550.4
4	564.6	12.5	552.1
5	565.6	14.0	551.6

Appendix G

Initial Geologic Inspection Report

State of California The Resources Agency

Memorandum

Date : July 11, 1997

To : Bill Mendenhall, Chief
Engineering Studies Section, Northern District

Frank L. Glick, Chief
Project Geology Section, Division of Engineering
From : **Department of Water Resources**

Subject: Saeltzer Dam, Proposed Fish Ladder; Results of Geologic Inspection

Introduction

On June 10, 1997, I accompanied Kevin Dossey and two others from the Northern District to inspect the geologic conditions at the location of a proposed fish ladder at Saeltzer Dam on Clear Creek. The dam is on the south side of Clear Creek Road near Redding, California, as shown on the attached map (Figure 1). This dam has an existing fish ladder tunnel which apparently didn't get used by the fish. Therefore, a new fish ladder is being planned.

Saeltzer Dam is a concrete structure ranging from three to approximately 24 feet high and 250 feet long (see Photo 1). It's crest trends approximately N10°E across the east-flowing Clear Creek. It was reportedly built in about 1903 to divert water into an irrigation canal. The crest is about one foot wide. The pond behind the dam is now filled in with silt, sand, gravel, and cobbles so the depth of water averages only three to five feet. At the time of the inspection, water was flowing over the spillway section near the right abutment and over many other locations along the crest. Granitic bedrock is exposed on the right abutment (south side) and downstream of the dam (see Photos 2, 3, and 4). This dam is not under the jurisdiction of the Division of Safety of Dams.

The physical condition of the dam is very poor (see Photos 5, 6, 7, and 8). The concrete shows extensive deterioration and cracking. There appears to have been many concrete repairs in the past. Water currently flows into the dam in several locations via cracks and openings along the crest. Also, water flows out of the dam through construction joints, cracks, and seepage paths beneath the dam.

Existing Fish Ladder Tunnel

There is an existing fish ladder tunnel about 375 feet long in the right abutment of the dam. The downstream portal of the tunnel is located approximately 330 feet from the dam at the stream level. The upstream portal is a cut-and-cover box structure about 45 feet long (see Photo 9). It terminates about 30 feet upstream of the dam. The right (south) wall is made of in-situ bedrock and the left (north) wall and

SURNAME Frank L. Glick 7-11-97

DWR 155 (Rev. 2/86)

roof is made of concrete. The transition from the excavated tunnel to the cut-and-cover section occurs about 15 feet downstream of the dam crest.

The excavated portion of the tunnel is no longer in use and was not inspected. It has been blocked off with wood planks at the transition location. A subsequent cut in the cut-and-cover concrete wall (see Photo 9) diverts any water flows directly back to Clear Creek immediately downstream of the dam.

The cut-and-cover portion could be uncovered and enlarged as part of the new fish ladder. An additional ten feet or more of fish ladder width could be obtained by excavating the right bedrock wall and supporting it with a retaining wall to prevent the loss of an adjacent dirt road uphill of the fish ladder.

Proposed Fish Ladder in the Dam

I do not recommend building the proposed fish ladder in the existing dam because of the dam's poor physical condition. Construction activities in the dam could increase the leaking problems in the dam. At a minimum, this could result in serious liability issues. In a worse-case scenario, construction activities in the dam to build a fish ladder could result in a partial dam failure.

Geologic Conditions

Saeltzer Dam was built in a location where the canyon walls converge along Clear Creek. A gorge with 1:1 to near-vertical rock walls up to 50 feet high begins just downstream of the dam (see Photos 4 and 10). The Redding Sheet of the Geologic Map of California (scale 1:250,000) shows sedimentary rock units and Quaternary Alluvium at the dam site. However, my inspection of the site showed that the bedrock at the site is hard and fresh granitic rock. This type of rock is shown on the Redding Sheet about 1/4 mile north of the dam site. The Quaternary (Recent) Alluvium consists of sand to boulders in the active stream channel (see the area near the bushes in Photo 4) and locally overlying the bedrock above the active channel.

Foundation rock for the dam appears to be very good. Based on the bedrock exposures on both abutments and in the channel downstream of the dam, the foundation is probably slightly weathered to fresh, hard, granitic rock. Jointing in the bedrock is well defined. There appears to be a near-vertical, north-south preference with spacing from one to three feet, and an east-west preference dipping about 45 degrees to the north. Many of the exposed rock surfaces are joint planes.

There has been gold mining in the vicinity of the dam in the past. Downstream, on the right side of the channel, there are tailing piles overlying the bedrock. Also, several excavations along the rock jointing and a tributary creek have been mined.

Geologic Exploration

Geologic exploration drilling is not needed to design and construct a fish ladder in bedrock on the right abutment and right side of the stream channel downstream of the dam. The bedrock there appears to be mostly fresh and hard granitic rock. It should be more than adequate to support the proposed fish ladder.

I do not recommend exploration drilling through the dam because the dam is in very poor condition. Drilling activities could worsen the leaking through the dam. Hydraulic fracturing could occur. Potential or real damage to the dam from exploration drilling could result in a serious liability problem between the owner and the State. I believe that core drilling in the dam would show old, deteriorating concrete with open joints and cracks. I don't think the dam would hold the drilling water or drilling mud in the drill holes.

If someone insisted on conducting a drilling program through the dam, there are three methods which could be utilized:

1. Hand-carry small, portable drill rigs to each site. Drills like this are frequently used for grout holes and require an air compressor on the land.

2. Float a small barge with a small drill rig mounted on it to the crest of the dam.

3. Use a helicopter to place a small skid-mounted drill rig at the drill sites. Level pads would have to be built at each hole site prior to placing the rig.

All of these methods are time consuming and relatively expensive for the possible information to be obtained. For a program of three holes drilled through the dam into the foundation (approximately 40 feet each), method number 1 would be the least expensive. The cost for just the contracted equipment and labor would total about $15,000. There is a possibility, however, that this method may not be successful in obtaining good core samples. Method number 2 would probably achieve good drill core at a cost of about $25,000. Method number 3 would utilize the same drilling equipment as method number 2, but could cost twice as much.

Construction and Excavation

The best location to construct a new fish ladder facility at Saeltzer Dam appears to be on the right side of the dam. Specifications and drawings to construct the facilities should require that all alluvium and mining tailings be removed along the ladder alignment. A large track-mounted excavator would probably be a suitable piece of equipment to remove those materials under a "general excavation" pay item.

The bedrock will probably require blasting and/or jack-hammering to facilitate excavation. If blasting is needed, then "controlled methods" of drilling and blasting should be required to ensure clean cuts and excavations, and no damage to the existing dam. Well-written blasting specifications will be very important. Careful review of the Contractor's blasting submittals will also be very important. Project Geology can assist with these activities. To protect the dam, peak particle velocities at the dam should not exceed two inches per second.

A good on-site survey of the design elevations should be conducted prior to finalizing the plans and specifications. This activity will be very useful in determining the quantities of general excavation and bedrock excavation.

Dewatering will be an important item at this site. Water in the pond behind the dam will have to be routed away from the construction area. Also, the excavations downstream of the dam and near the stream channel may encounter groundwater. That water will have to be diverted and/or pumped out of the excavations so all work is performed in dry ground.

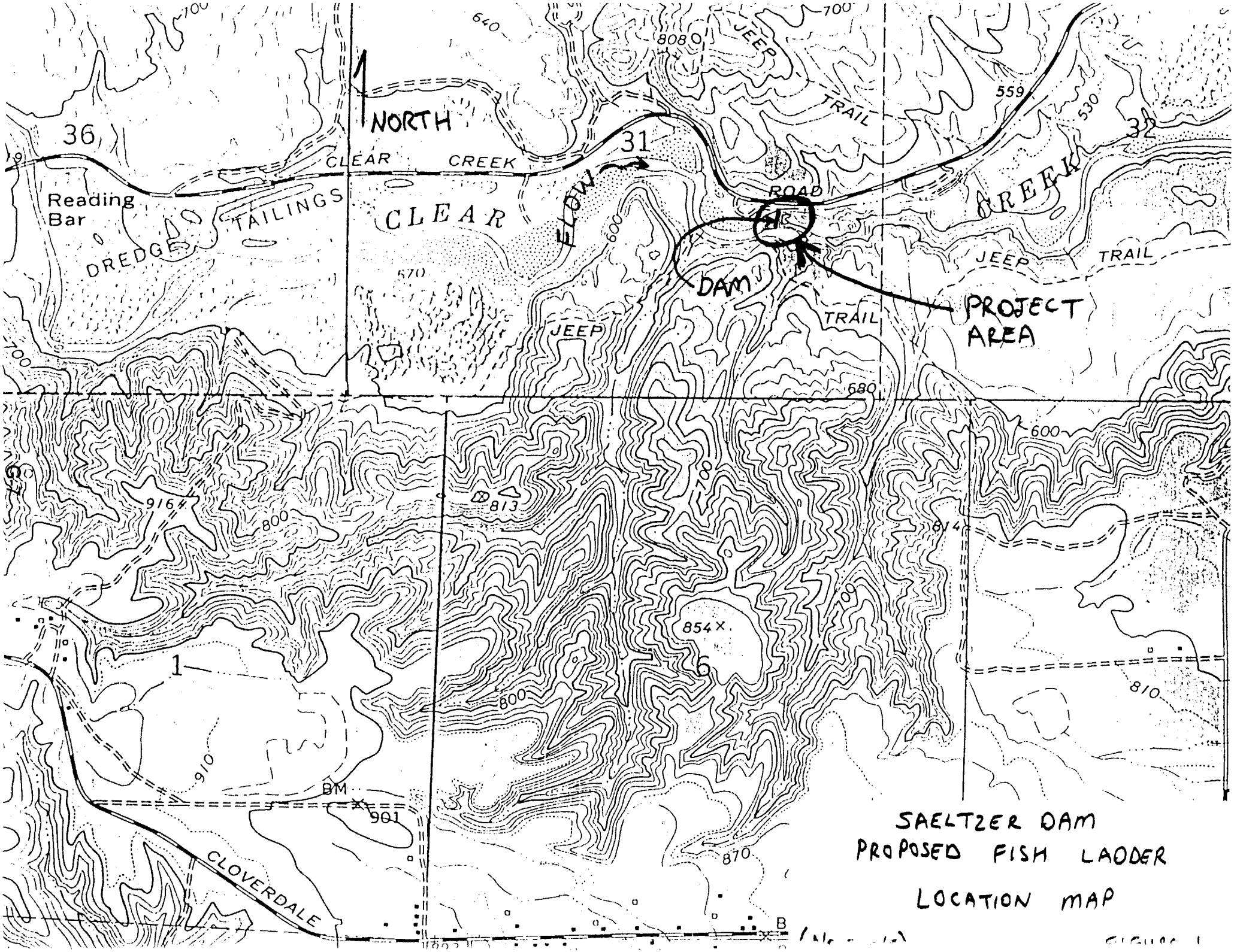
Conclusions

I believe a new fish ladder can be designed and built on the right abutment and right side of the stream channel without any costly geologic exploration. The foundation rock at the site appears to be fresh, hard granitic rock. Overlying alluvial materials and mining tailings should be removed from the fish ladder's foundation.

Thank you for the opportunity to assist you. Please feel free to call me at (916) 653-9624 if you have any questions or need additional information.

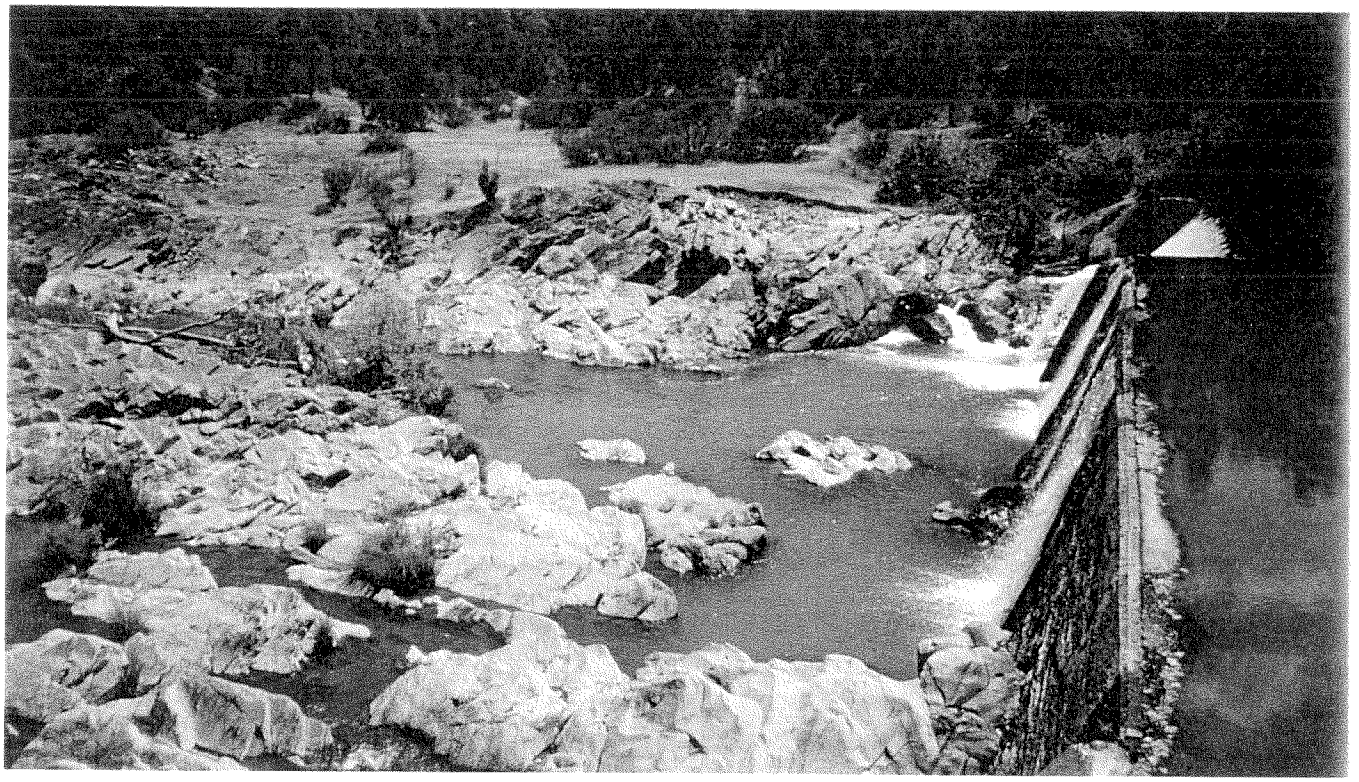
Attachments

FIGURES


NORTH
36
31
32
CLEAR CREEK
Reading Bar
DREDGE
TAILINGS
CLEAR
FLOW
CREEK
ROAD
DAM
JEEP TRAIL
JEEP
TRAIL
PROJECT AREA
700
640
808
559
530
600
570
680
916
800
813
814
854
810
910
BM
901
870
CLOVERDALE
1
6
SAELTZER DAM
PROPOSED FISH LADDER
LOCATION MAP

PHOTOGRAPHS

Photograph 1: View looking south at the downstream face of Saeltzer Dam. The area of hard granitic rock on the south side of the dam appears to be the best location at this site for a new fish ladder.

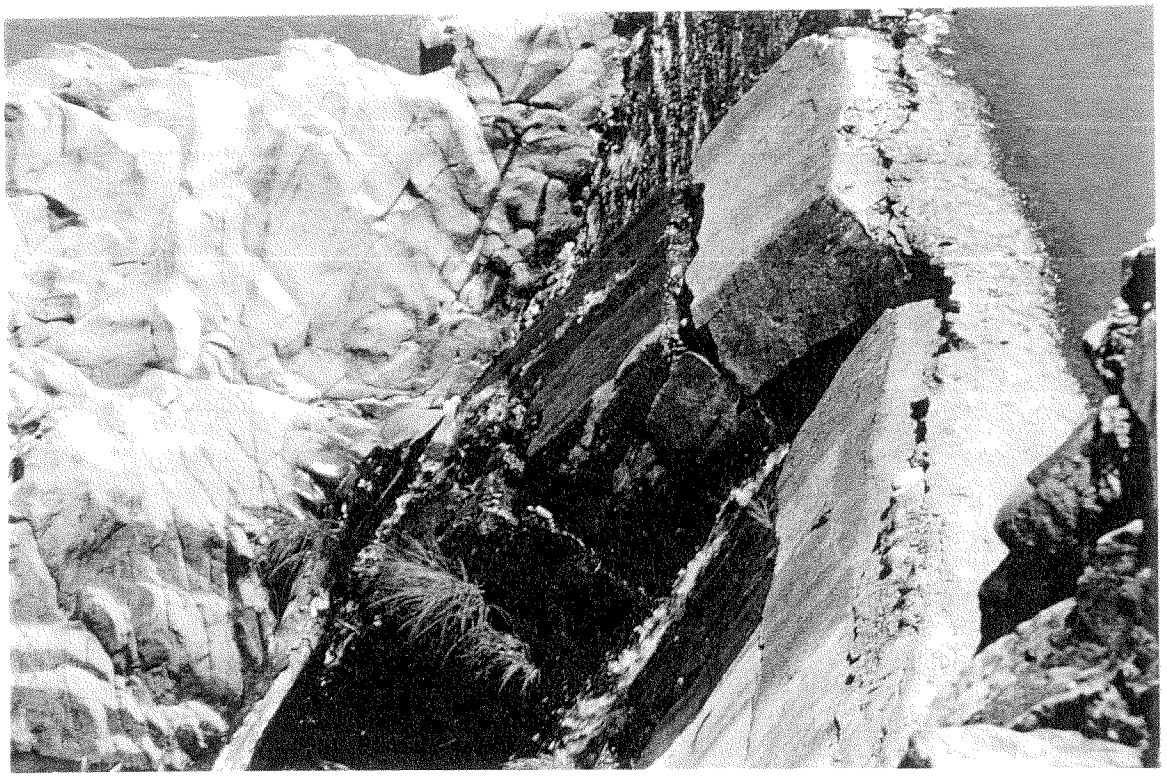


Photograph 2: View looking north at the downstream face of Saeltzer Dam and the granitic bedrock exposed in the stream channel.

Photograph 3: View looking southeast at the bedrock in the center of the stream channel and on the right side of the stream channel downstream of Saeltzer Dam.

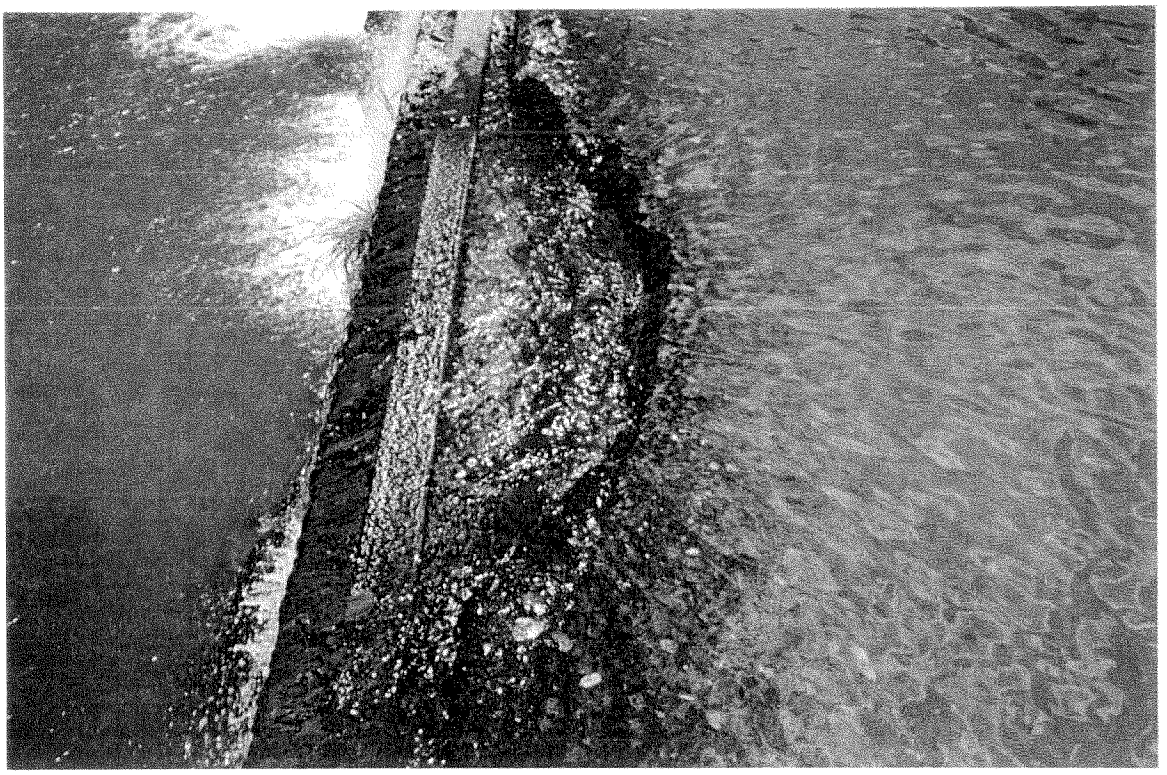
Photograph 4: View looking east at the channel downstream of the dam. The bedrock gorge begins where the calm water ends.

Photograph 5: Close up view of the dam near the left abutment. Note the concrete repair work and the water flowing out of open cracks on the downstream face.



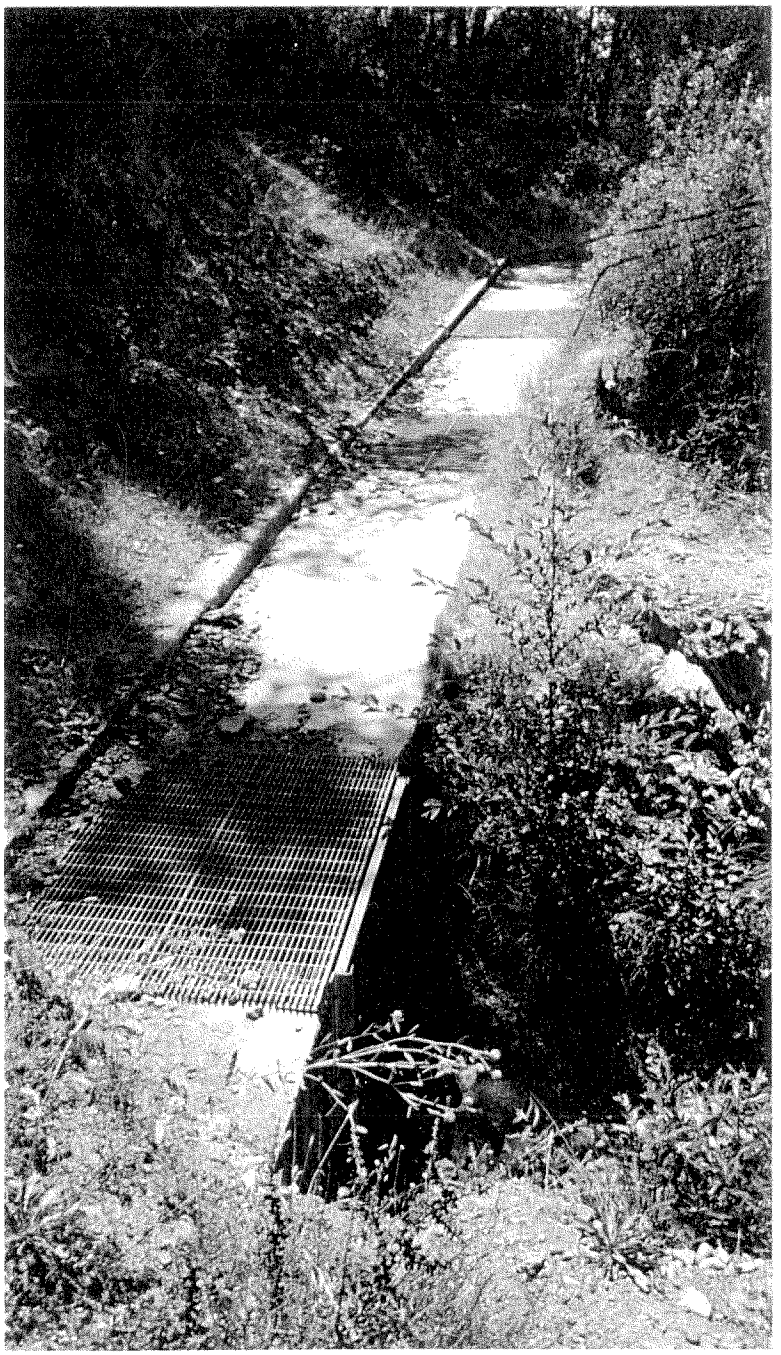
Photograph 6: Close up view of an open crack in the crest of the dam.

Photograph 7: Close up view of an open crack-slump feature in the crest of the dam. Note the water flowing into this feature.



Photograph 8: Water flowing from the toe of the dam into the stream channel.

Photograph 9: View looking west at the cut and cover box structure. The excavated tunnel begins at the bottom of the photograph. Water enters this structure behind the bushes in the upper right part of the photograph. Water now exists the structure through the cut in the concrete (in the lower center of the photograph) instead of flowing into the excavated tunnel.



Photograph 10: View looking east at the bedrock in the stream channel gorge downstream of Saeltzer Dam.